NOVEMBER, 1933
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Contractors and Engineers Monthly

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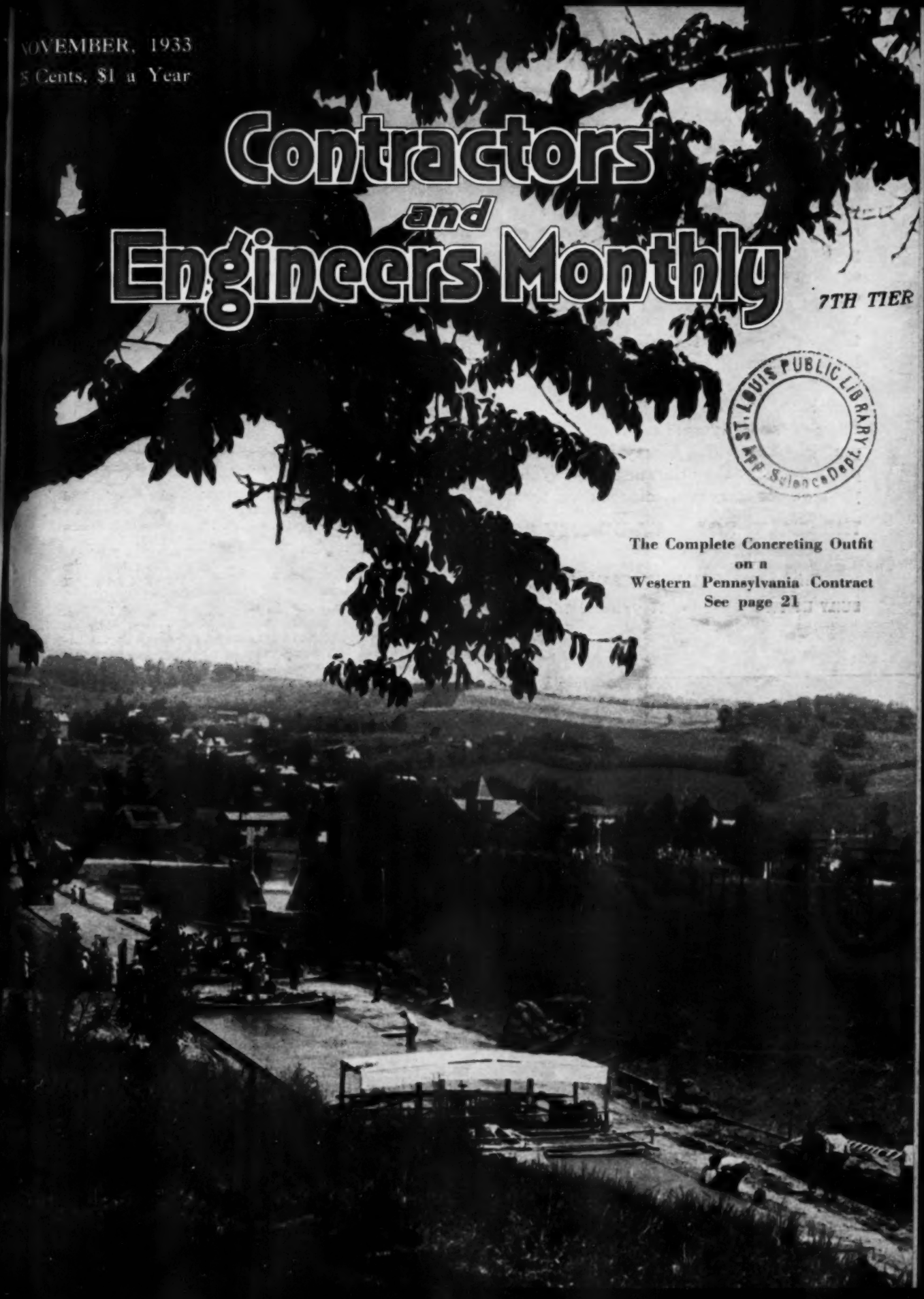


The Complete Concreting Outfit
on a
Western Pennsylvania Contract
See page 21

for "ALL-WINTER" *work*

On the many projects that will get going this Fall, the Euclid Tu-Way answers the troublesome question of *winter earth-moving*. Where other types of hauling equipment "bog-down" and are totally inadequate for All-Winter operation, the Tu-Way will haul capacity loads day after day economically—and free of trouble. *Here Are The Reasons* . . . mounted on the easy rolling Permo-Arch Tracks, with their large amount of ground contact, the Tu-Way rolls easily wherever a tractor can go. The one-piece Body makes it possible to build-in greater strength and rigidity with less bulk weight—this feature adds to the Tu-Way's "ease of travel" over soft-going. Then, there are no door or down-folding gate mechanisms to cause trouble when exposed to freezing or sticky mud. This proved unit turns in a road-way width of 22 ft.—dumps freely to either side and throws the load out clean and clear of the tracks, spreading it as desired. Euclid Tu-Ways have been working on many, varied jobs for the past year. They are perfected to give maximum service under *all conditions*. The interesting facts of Tu-Way operation on the Small Company's West Va. High-way Job is actual proof of performance. For other authentic *Job Facts*, see your dealer or communicate directly with

THE EUCLID ROAD MACHINERY COMPANY
CLEVELAND OHIO

Originators of TU-WAY CRAWLER WAGONS

BUILT IN TWO SIZES • 11 yd. and 15 yd. CAPACITIES

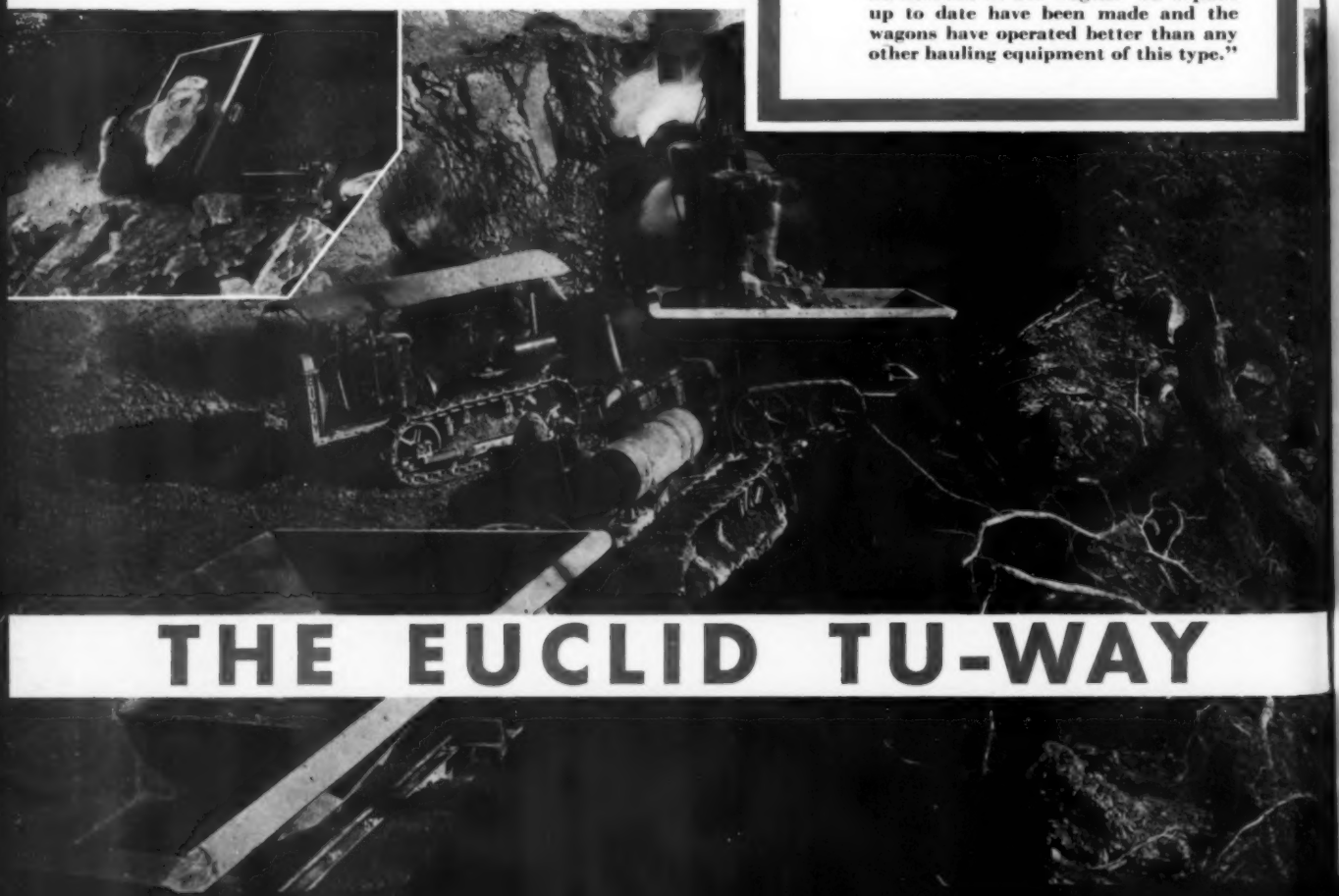
JOB FACTS

Contractor . . . Patsy Small & Company, Bluefield, W. Va.

Type of Job . . . W. Va. Highway—Bluefield to Princeton through the Alleghenies

Job Equipment . . . 1 Bucyrus 42-B Steam Shovel
2 Caterpillar Sixties
2 11-yard EUCLID TU-WAY CRAWLER WAGONS

Facts of the Job . . . Job started in Dec. 1932. Wagons were worked daily all winter. Averaged 10 hours a day. Contractor states: "No time has been lost on account of the wagons—no repairs up to date have been made and the wagons have operated better than any other hauling equipment of this type."



THE EUCLID TU-WAY

Creating Lake Springfield

Concrete Core Wall Construction

by C. E. Carson Co.

at

Springfield, Illinois

Steel Sheet Piling Cut-off and Concrete Core Wall

A NEW water supply project for the City of Springfield, Ill., is rapidly approaching completion. It involves the construction of an earth-filled dam, a concrete spillway bridge across Sugar Creek and a dividing dam at a low point in the divide between the valleys of Sugar Creek and the south fork of the Sangamon River. The earth-filled dam is 1,600 feet long and has a maximum height of 40 feet with a top width of 28 feet and side slopes of 3 to 1 upstream and 2 to 1 downstream with an additional rock fill at the toe of both slopes. There is also concrete slope paving on the upstream face. A concrete spillway bridge at the west end of the earth section has been built, consisting of a spillway proper arranged to provide for automatic folding-type drum gates, and concrete piers and abutments. The dividing dam is an earth-filled dam 1,800 feet long with a maximum height of 30 feet, a top width of 32 feet and side slopes of 3 to 1 upstream and 2 to 1 downstream with rock fill and a cut-off wall similar to the main dam.

Under separate contracts there is being built 3 miles from the main dam a 19-span concrete bridge across Lake Springfield which will be created by the dam and which will be 15 miles long. This concrete bridge is being built by the city. In addition, there is another 5 miles upstream where the state is constructing a 36-span bridge on the main road to St. Louis.

Flood Conditions in Spring

The contract for the construction of the main dam spillway bridge and the dividing dam was awarded to C. E. Carson Co. of Chicago on January 12, 1933. The contractor moved into the job on January 27 and the subcontractor on excavation and backfilling, H. H. Enbody & Son of Aurora, Ill., started digging a 1-mile diversion channel between Sugar and Horse Creeks on March 6. There is a drop of 8 feet from Sugar Creek to Horse Creek and by digging a channel 9 x 15 feet deep and 10 feet wide at the base, it was possible to divert Sugar Creek and obviate the need of a diversion culvert through the main dam. Unfortunately the channel was completed a little too late, for on March 24 a flood occurred which cost the contractor one month of progress. On May 15 a second flood came down Sugar Creek and even the diversion channel was not enough to handle the high waters so that work was seriously retarded again. This flood was one of the three highest recorded on Sugar Creek in 100 years. It is interesting to note that there was some local criticism of the Lake Springfield project because it was believed that the reservoir would never fill up. The water department, however, figured that had Lake Springfield dam been completed at the time of the second flood and had the inflow continued at the same rate, it would have required only seventeen days to fill the entire 15-mile reservoir. However, it is expected that in less than one year after the completion of the dam the reservoir will be filled without the aid of floods.

On March 10 the subcontractor moved the first dirt on the dam and on April 25 the first steel sheet piling was driven for the concrete core wall. On May 3 the first concrete was poured.

The Sheet Piling Cut-Off

A small Buckeye crawler crane with a dragline bucket was used to dig the core trench before the steel sheet piling was driven. This was excavated to a depth of about 6 feet and then 20-foot piling of standard heavy 15-inch section flattened to a 19-inch section and fur-

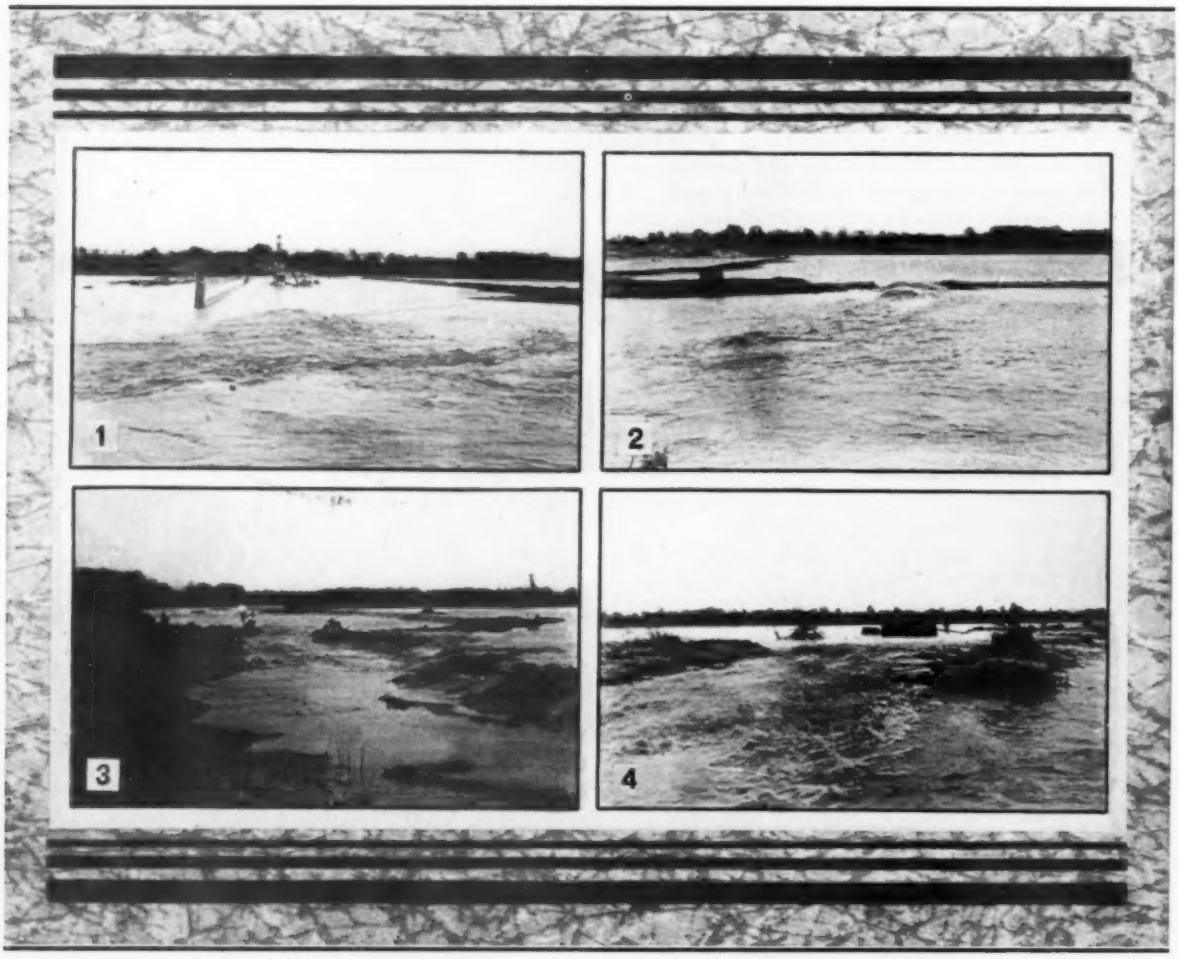
nished by the Inland Steel Co., was driven by a Bucyrus-Erie steam crane with pile leads and a McKiernan-Terry steel hammer.

UNIT PLYWOOD FORMS USED FOR CORE WALLS

The steel sheet piling continued the entire distance across the valley for a distance of about 1,200 feet over which the concrete core wall was placed, this core wall continuing beyond the sheet piling and into the rock outcrop into the hills on either side. As a protection against moderate high water during concreting, a temporary earth dike was thrown up across the valley about 200 feet upstream from the core wall location and carried to a height of about 8 feet. During the second flood this was hurriedly built up by hand labor to about 10 feet but was over-topped by water, as shown in some of the accompanying illustrations.

The first lift of the core wall, which was 3 feet thick at the bottom and 1 foot thick at the top, was 12 feet high, consisting of 3 feet of base encasing the tops of the steel sheet piling and 9 feet of wall poured between the Uni-forms furnished by the Universal Form Clamp Co. These forms were in panels measuring 2 feet wide x 3 feet high, the frame being of light angles with two angle stiffeners each 3 feet long. The face of the form was of 5-ply wood, the surface of which was treated by the manufacturer, and the forms were attached to each other by means of cut nails merely driven through jig-punched holes in the angle forms. The angle frames were slightly offset at three points in the longer angles and two points in the shorter angles to permit the insertion of strap ties and also the brackets to hold scaffolding so that workmen could place the unit forms in the next two tiers above. The ties for the forms for the cut-off wall were special carbon band iron ordered to dimension for each tier and were inserted through the offsets which were also used for placing the brackets and were held by nails dropped through short double offsets or deformations at each end of each tie. For concrete above water on other structures rods with cones were used to permit careful finishing of the concrete surface.

Liners were used on one side of the forms only and no wales were used. The vertical liners were 2 x 6's and the horizontal liners 2 x 4's. The vertical liners were held in place by an ingenious liner clamp consist-



FLOOD CONDITIONS AT THE SITE OF THE LAKE SPRINGFIELD DAM

1. A section of the core wall flooded out. 2. The break in the protection levee. 3. The point where the contractor cut the levee to relieve the pressure. 4. A close-up of 3. Photographs: courtesy of Maurice Enbody, H. H. Enbody & Sons, Subcontractor.

The Carpenter Shop With Forms Under Construction

ing of a heavy tempered steel wire bent to a U-shape to fit over the 2 x 4's and 2 x 6's and with hooked ends fitting into holes provided for them in the angle frames of the unit forms. These liner clamps were made up with small wood blocks by the contractor, using scrap wood about 6 x 8 inches long, 3 to 4 inches wide and about 1½ inches thick. At the middle of the flat side a transverse cut was made, big enough to hold the liner clamp wire, and nails put in to hold the wire in place. For each vertical liner two of these liner clamps were used—one sloping downward hooked into one of the top forms and the second sloping upward hooked into one of the lower forms. With a few tamps of a hammer the hooks were driven along the liner until they were held tight and then a nail driven through the block to hold them in place.

The unit forms were oiled after every third time they were used and the contractor found it possible to use the form as received from the manufacturer from eighteen to twenty times before the face of the plywood lost its finish. Then the plywood was turned and the form used again for a like number of times. Then, if the frame had not been damaged, the plywood could be replaced for about fifty cents and the form continued in service. Most of the panel forms were completely submerged during the floods for about 10 days without any apparent damage.

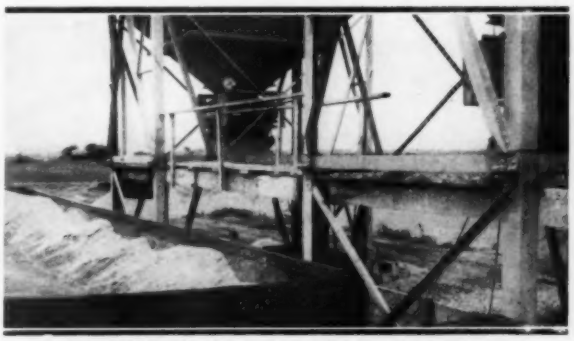
Prior to the erection of the forms ⅝-inch round rods, 2 feet on centers both ways on both faces, were erected for reinforcing the 30-foot concrete cut-off wall. The rods were tied at all intersections.

The forms were stripped in twenty-four hours after pouring and the concrete core wall covered with canvas and sprinkled for seven days. The contractor used 4 x 8-foot panels of 5-ply wood ¾-inch thick on all above-water concrete to insure a smooth finish over large unit areas. One carload of plywood was used for this purpose.

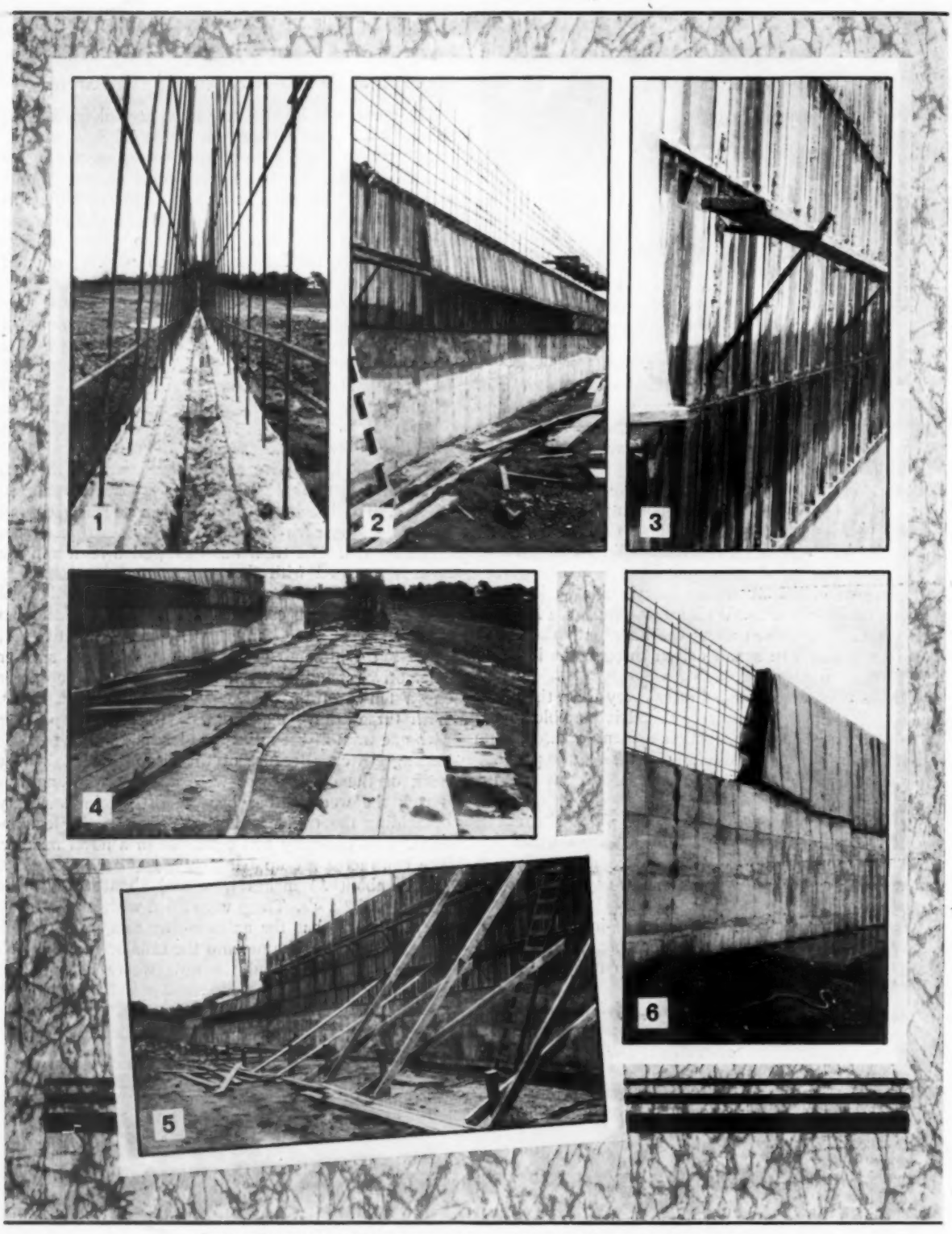
A sawmill was set up on the hill at the west end of the dam, where the contractors and subcontractors offices were located, to make all of the special forms required on this job. The equipment of the mill included a DeWalt cut-off saw, a C. H. & E. table saw and a 36-inch band saw made by the Chicago Machinery Exchange. Because of the numerous delays in concreting the core wall and the backfilling, caused by floods and continued wet weather, one mill man and two carpenters were able to take care of all of the special form work. This crew would had to have been greatly increased had the project continued with the speed originally intended.

Making Up and Transporting the Batches

The contractor laid ¾-mile of industrial track from the batching plant to the west bank of Sugar Creek, running down a fairly steep grade to the upstream side of the core wall. The batch plant itself was set up on a standard railroad siding to which the McGrath Sand & Gravel Co. of Pekin, Ill., delivered both sand and gravel in gondola cars. A P & H 206 crane with a 40-foot boom and ⅝-yard Kiesler clamshell bucket unloaded the aggregate either to stockpiles or direct to two Blaw-Knox single batching plants. The two unit batching plants were set up with about 14 feet of space between them which was spanned by a wooden bridge at the elevation of the batching platform. The Sweet Steel Co. industrial track was laid from the batchers and continued for about fifteen car lengths beyond the second batcher. About ten minutes were required to load the ten-car trains, the method being to run the train with a locomotive at the head entirely through so that the last car was immediately beneath the sand batcher. The batchman then made up all of the sand batches, filling each batch box as it was spotted beneath the bin. The train was then pulled back and the process repeated with the gravel. Individual batches for one yard of concrete were used. The industrial hauling equipment consisted of one 6-ton Whitcomb gas locomotive, one 6-ton gas Plymouth locomotive and one 7-ton Whitcomb gas locomotive with the smaller locomotives hauling seven-car trains and the larger one a ten-car train of Koppel cars and batch boxes. With three trains, maximum concreting was possible with one train at the mixer, one loading and one on the passing switch. Because of the steep grade down the bank of the creek, there were one or two runaways during the wet weather because of the impossibility of holding the trains with the brakes on the locomotives. This difficulty was overcome in a novel manner. The contractor set up between the 36-inch gage rails frames about 33 inches wide and about 6 feet long made up of 2 x 4's. These were filled with sand slightly heaped up so that the axles of the cars would knock the sand from the frame onto the rails or into the slots between the frame and the rails where it would be effective in sanding the rails and wheels. About ten of these frames were inserted 25 feet apart, and entirely prevented further difficulties from slippery tracks.



The Bridge Between the Two Batching Plants



REINFORCING AND FORMS FOR THE CONCRETE CORE WALL

1. View along the top of the first lift, showing the reinforcing in place for the second lift. 2. Ply-wood unit forms in place and some units ready to be placed. 3. A detail of the forms showing a pair of brackets holding the plank scaffolding. 4. Mats with cable slings for the 27-E paver with tower equipment shown in the background. 5. The back of the core wall, showing the vertical and horizontal liners and braces. 6. The concrete was cured by covering with canvas and sprinkling for seven days.

The cement dock was located about 200 feet from the batching plants, and the handling of the cement bags from the freight car into or through the cement shed and onto the platform, from which the five bags per batch were emptied into the cement containers of the batch boxes, was all done by subcontract at an exceedingly low rate by two to five men. One carload of cement was kept in storage in the cement house and about one out of ten carloads was rehandled. The contract called also for shaking all bags and baling them for return to the producer. The batching crew consisted of one crane operator, two men in the cars and one batch man. There was sufficient time between trains for the crane man to fill both bins, which was an ample supply for the twenty batches. There were no brakemen on the trains, the locomotive men throwing the switches themselves.

TOWER MACHINE USED FOR POURING CONCRETE

A Ransome 27-E paver equipped with a tower and chutes ran across the valley between the core wall and the industrial railway track. This machine poured the first 12 feet of the core wall as one lift, then the subcontractor spread the backfill in 8-inch lifts until the fill was even with the top of the concrete. The paver was then walked onto the fill and the remainder of the 30 feet of core wall poured in one 18-foot lift. The paver moved on 6 x 12-foot mats of 3-inch native lumber taken from the lake site. These mats were each equipped with two cable slings made up with cable clips and were moved by a Buckeye loader equipped as a crane, which also unloaded the batch boxes from the trains and dumped them into the paver skip. Two men dumped the batches and the Ransome operator handled the paver and tower hoist. There was one man on the chutes and four or five men working in the concrete, spading it by hand and vibrating it with Jackson vibrators. The concrete was poured fairly dry as the batches were made up with a definite water strength ratio and with no admixture. The concrete was mixed 1½ minutes. Water for the paver as well as for sprinkling the concrete for curing was supplied by a C. H. & E. Simplex pump delivering through a 2-inch pipe line to the 1½-inch Boston Woven Hose & Rubber Co. paver hose.

The concrete for the dividing dam was mixed by the Ransome plant and hauled by trucks equipped with 2-yard batch hoppers 4 miles over a road and delivered to the forms by a 60-foot Barber-Greene portable conveyor. This same method was used for pouring the 700 feet of retaining wall for the spillway at the west end of the dam.

QUANTITIES

Earth excavation	451,000 cubic yards
Soft rock excavation	25,000 cubic yards
Rock (requiring blasting)	36,000 cubic yards
Concrete	28,000 cubic yards
Steel sheet piling	455 tons
Reinforcing steel	1,260,000 pounds

The contractor operated his own oxyacetylene cutting and welding outfit for repairs. This Bastian-Blessing outfit was used to particularly good advantage when two crane accidents occurred in one day and repairs were speedily made.

PERSONNEL

Water, according to the original contract, was to be impounded on November 1, 1933, behind the dam and the work completed by January 1, 1934. Flood conditions causing delays in the work made extensions in time necessary so that the project cannot be completed until some time during the spring of 1934.

Burns & McDonnell of Kansas City, Mo., were the engineers of design and construction and were represented by R. J. Morehouse as Resident Engineer. The work was carried on under the direction of S. T. Anderson, Superintendent of Lake Construction. The general contractor was the C. E. Carson Co. of Chicago, Ill., for whom W. A. Forshee was Superintendent. The subcontractor on excavation and fill was H. H. Enbody & Son with Maurice Enbody in charge.

A Washington-Alaska Highway

THE suggested project of an improved highway connecting Seattle, Wash., with Fairbanks, Alaska, a distance of 2,250 miles, has advanced a step further with the recent submission to President Roosevelt of a report by a Special Federal Commission, appointed under an act of Congress to investigate the practicability of such a highway. Thomas P. Henry of Detroit, President of the American Automobile Association, said in commenting on the findings of the Commission:

"The report on the proposed U. S.-Canadian-Alaska highway is most comprehensive and is a powerful argument in favor of the project. Since the greater part of the 1,183 miles of new construction necessary is in Canada, much depends upon the attitude of Dominion officials. The report to President Roosevelt offers a concrete basis for further negotiations between the two countries.

"Aside from the recreational advantages that always come with the opening of new areas and new scenic attractions to our motoring millions, there are also economic factors to be considered. In this connection, the reports says: 'Since the annual cost of operating Federal agencies in Alaska is about $7,000,000 in excess of revenues, the expenditure of an additional $3,000,000, spread over several years, for the purpose of development of the territory to a more nearly self-supporting basis is not unreasonable.'

"The estimated cost for building a highway connecting with the U. S. system at Seattle and the Canadian system at Hazelton, B. C., and ending at Fairbanks, Alaska, is around $2,000,000 for the Alaskan section and $12,000,000 for the Canadian section.

"One of the many benefits to be gained from such a highway, as set forth in the report of the Commission is 'The new road would make accessible to the continental highway system the existing road net in central Alaska comprising about 900 miles, providing a new and valuable area for exploration, for recreation or for business purposes'."

A Scene on the Strom Construction Co. Road Construction Contract in the Land O' Lakes, Minn. A Lorain 75-B Shovel Is Shown Loading to Crawler Wagons Pulled by Allis-Chalmers Model L Tractors.

Indiana Experiments With

New Way to Set Dummy Joints

On Federal Aid Project in Jay County

THE State of Indiana is revising its specifications and has permitted as an alternate to its existing specifications the use of a finishing machine in the rear of the first finishing machine, the latter machine to screed over the joints as placed by the joint installing machine, with the screed attached on the rear of the installer. The first project on which the Flex-Plane joint machine was used is located at Portland, Ind., in Jay County and is known as Federal Aid Project E-278 on U. S. Route 27. It is approximately 6 miles long, or to be exact 30,000 linear feet. Hinton & Smalley of Celina, Ohio, was the contractor.

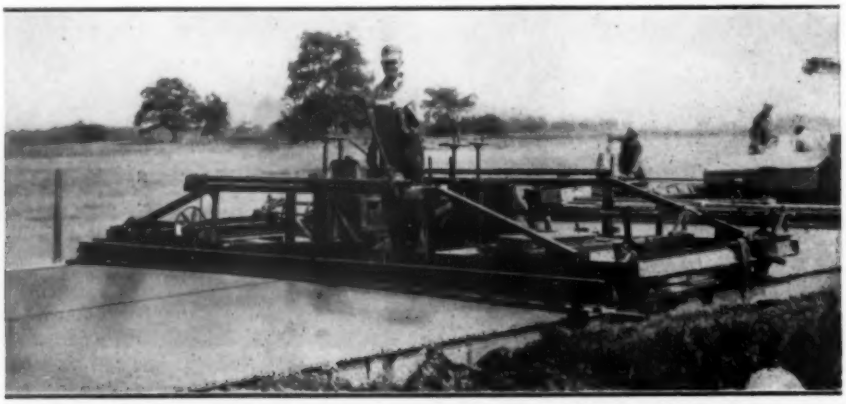
On this job the concrete was rescreeded after the free water had disappeared and while the concrete was still in a workable or plastic condition. By doing this it was possible to refill any settlement in the concrete surface caused by minute water pockets, thus releveling the concrete to an exact surface. Also all of the dummy joints were placed in front of the screed instead of behind it.

A poured dummy joint was used for both transverse and longitudinal joints. The steel V plate ⅝-inch wide, tapering to ¼-inch, and 2½ inches deep was inserted by a combination joint and screeding machine. Before the concrete had taken its initial set, this plate was removed and the corners were edged with a special edging tool so that the joint when poured with asphalt filler was 1 inch wide. This made the longitudinal joint a traffic marker but a 4-inch stripe was also required by the State.

At certain points, transverse contraction joints of the same character as the longitudinal joints were installed by the same machine, but in a different manner from the usual method. The transverse installer which cut the groove for the steel V-plate which was placed by hand was located in front of the machine and was operated by engine power. Following the installation of the transverse joints, the longitudinal joints were placed in position from the center of the machine, at the rear of which the screed was operated.

Experiments had been made previously by the Flexible Road Joint Machine Co. in screeding over expansion joints to determine the correct time, which was found to be just before the initial set of the concrete. It was found that excellent riding surfaces were secured by this method. This practice was first initiated some years ago by H. G. Sours, Engineer of the Summit County Highway Department, Akron, Ohio. The results were so satisfactory that other counties in the state adopted the same practice. Roads built by this method as long as six years ago still show smooth surfaces free from bumps.

The experiments in Indiana, while somewhat similar, were done in a different manner as two finishing machines were used. The rear machine moved only forward and thus did not have to move in reverse gear. The final screeding was done after the free water had drained from the concrete. This is considered very important, inasmuch as there was virtually no laitance and consequently it is expected that there will be no peeling of the surface in years to come as has been characteristic in the past on jobs where the final screeding was done at a time when the surface contained free water.



The Combination Jointing and Resurfacing Machine Installing the Contraction Joints

Running a Highway Job

with

Unemployment Relief Labor

Baldwin Bros. Co. of Cleveland, Ohio, Used Many Time and Trouble Savers on Bakerstown, Pa., Job

TWO or more years ago, reporting a concrete paving job was devoted chiefly to telling how many men could be saved in the various operations by the use of machinery. Today, with the present Federal specifications, the contractor is pushed harder than ever before to handle the work economically with the horde of laborers which are required to replace the machines which have been temporarily legislated out of service in the interest of the local labor of the community where the road is being built. We will not dwell on the finer points of the distribution of work throughout all grades of unskilled and skilled labor but point out some of the methods this contractor used to insure the best of work with the human tools he was required to use.

One of the first problems the contractor has to solve today is the question of the number of gangs and how he will distribute them to give not more than the 30 hours maximum employment to the laborers. On the Baldwin Bros. Co. contract on Pennsylvania Route 72, Section 8, the work was distributed over three gangs. No. 1 crew worked Monday, Tuesday, Wednesday and Thursday mornings, No. 2 crew worked Wednesday, Thursday, Friday and Saturday afternoons, and No. 3 gang worked the remaining morning and afternoon shifts. This made the job of timekeeping one of higher mathematics but the foremen for the various gangs kept their own times, turned them over to the chief timekeeper and managed very well to keep things straight and to the satisfaction of the contractor and the engineers.

Aggregate Supply and Batching

The contractor purchased both crushed limestone and sand delivered to stockpiles at the batching plant and bulk cement plant which were set up at about the middle of the job and just off the grade below a bridge which eliminated a grade crossing of the new road with a fairly heavily traveled secondary road. The material producers delivered stone on a spur track at the Bakerstown, Pa., railway station about 2 miles from the batching plant and unloaded it to trucks with a McMyler-Interstate locomotive crane. The sand was delivered direct to the batching plant by trucks, hauling from the producing plant in Pittsburgh. The cement was

unloaded from the B & O Railroad bulk cement box cars which were run onto an old coal trestle and the cement delivered through unloading chutes beneath the cars direct to steel tanks carried on flat bed trucks. These hauled the cement to the delivery hopper of the Butler bulk cement plant which was run by a LeRoi gasoline engine.

The contractor's Johnson 2-compartment weighing batching plant was kept filled with aggregates by a Koehring 401 crane with a 55-foot boom and a 1-yard Owen bucket. The fleet of 2-batch Indiana trucks owned by a subcontractor, Danner Trucking Co., varied from five to twelve trucks. They drove beneath the batching plant, received the two batches of aggregate, and then drove straight through to the bulk cement plant about 150 feet distant and at right angles to the batching plant. The dry batches consisted of 1943.2035* pounds of stone, 1270.7934* pounds of sand and 579.8766* pounds of cement. The crew for the operation of the batching plants consisted of a crane man, an aggregate batching man, one man receiving cement, one man batching cement, and one man opening the covers on the steel cement containers in the batch trucks before they were loaded and covering them with the steel lids just before the trucks pulled out to the road. These cement containers were designed by the contractor and made to his specifications. They were hung at the front of the forward batch and at the back of the rear batch on special trunnions attached to the sides of the trucks.

A sign attached to the aggregate batching plant where it was in full view of the truck drivers as they approached the plant is worthy of attention. It seems that through the carelessness of some of the drivers it was more than uncommon for the gate between the two batches carried by the trucks to be left unlatched so that both batches were dropped into the paver skip at one time. This was wasteful, for both batches would be shoveled from the skip and discarded as the proportions are badly out of line when any attempt is made to shovel out one of the two batches. The sign placed the responsibility for this directly on the shoulders of the individual truck drivers by charging them for the material wasted if two batches were dropped at one time.

Preparation of Grade and Form Setting

A Galion power grader worked well ahead of the paving and prepared the grade for the fine grading crew. The trench for the forms was cut by hand labor, spread with granulated slag brought up by wheelbarrows and compacted by hand tamping. This contractor has used this method for many years to secure a firm foundation for the steel forms and has found it much easier to get the grade of the forms true at the start with a certainty of holding this grade with the heavy finishing equipment than with any other method. He stated that a carload or two of stone dust is usually easy to buy cheap as it is a drug on the market at all times and the investment is a profitable one.

There were fourteen men preparing the trenches for the forms and a form setter and helper on each side. A regular crew of twenty-two men worked on the fine grade with picks and shovels, in place of the usual power grader, fresnos and subgrader. A Buffalo-Springfield 5-ton gasoline-driven roller compacted the fine grade and left a fine appearing stretch of foundation for the concrete.

The Blaw-Knox 8 and 10-inch forms were set 20 feet wide for the first strip of pavement, with the 10-inch forms on the outside and the 8-inch on the inside next to the remaining 10-foot strip to be poured later. There were two men back on the grade just ahead of the paver lining up the forms and one man oiling them. On this job it was intended to run two pavers, the first inside the forms pouring base and the second outside pouring the top course on the reinforcing fabric. This did not work out as the finishing machine could not keep up with the pace of the two pavers. Hence the one paver was run inside the forms until a bad section of subgrade was met; after that it was run outside, leaving the grade in perfect condition for the concrete and not cut up by either trucks or the crawlers of the paver.

The New Paver Sets the Pace

A new 1933 Koehring 27-E paver with a 27½-foot boom poured all the concrete, but the second paver was held in reserve in case anything did happen to the regular machine. One man dumped the batches into the skip and the paver operator quickly raised them to the drum for the one-minute and fifteen-second mix before delivering them to the road. As the lower course had to be struck off 1½ inches below the top of the forms for the placing of the reinforcing, a Caterpillar Thirty tractor was held between the forms to pull the strike-off, as the paver was working outside the forms. Between the strike-off and the tractor was a scratch-board worked by two men as a final check for the elevation and contour of the grade.

The Truscon reinforcing mesh which was laid on the lower course of the concrete was handed in by the scratch-board men and placed by the pit men. There were four pit men, two spaders and one steel man who set the Truscon steel center joint material against the 8-inch form and staked it with the ⅜-inch deformed dowels. The expansion joints of Elastite material were placed as specified at all P.C.'s and P.T.'s and at all breaks in the vertical curves as well as at intervals of about 200 feet on level tangents. These were set by the concrete and pit foremen, using a steel bulkhead. A 6-inch wooden bulkhead was used for the end of the day's run.

A Lakewood screed did the machine finishing of the slab and carried a Heltzel cutter wheel for the center joint slot. Three men handled the machine finishing operation, two shoveling to the strike-off and one operating the machine. The strike-off carried an adjustable screed so that either a flat surface or a crowned surface could be struck off with the same machine.

Finishing was handled by two men who dragged and checked the surface with a 10-foot straight-edge and brought the surface to a satisfactory level with 10-foot long-handled floats. There were in addition two edgers who handled both the edges against the forms and the expansion joints. Three burlap men handled the placing of the wet burlap just behind the finishers. They car-

* Specified weight.

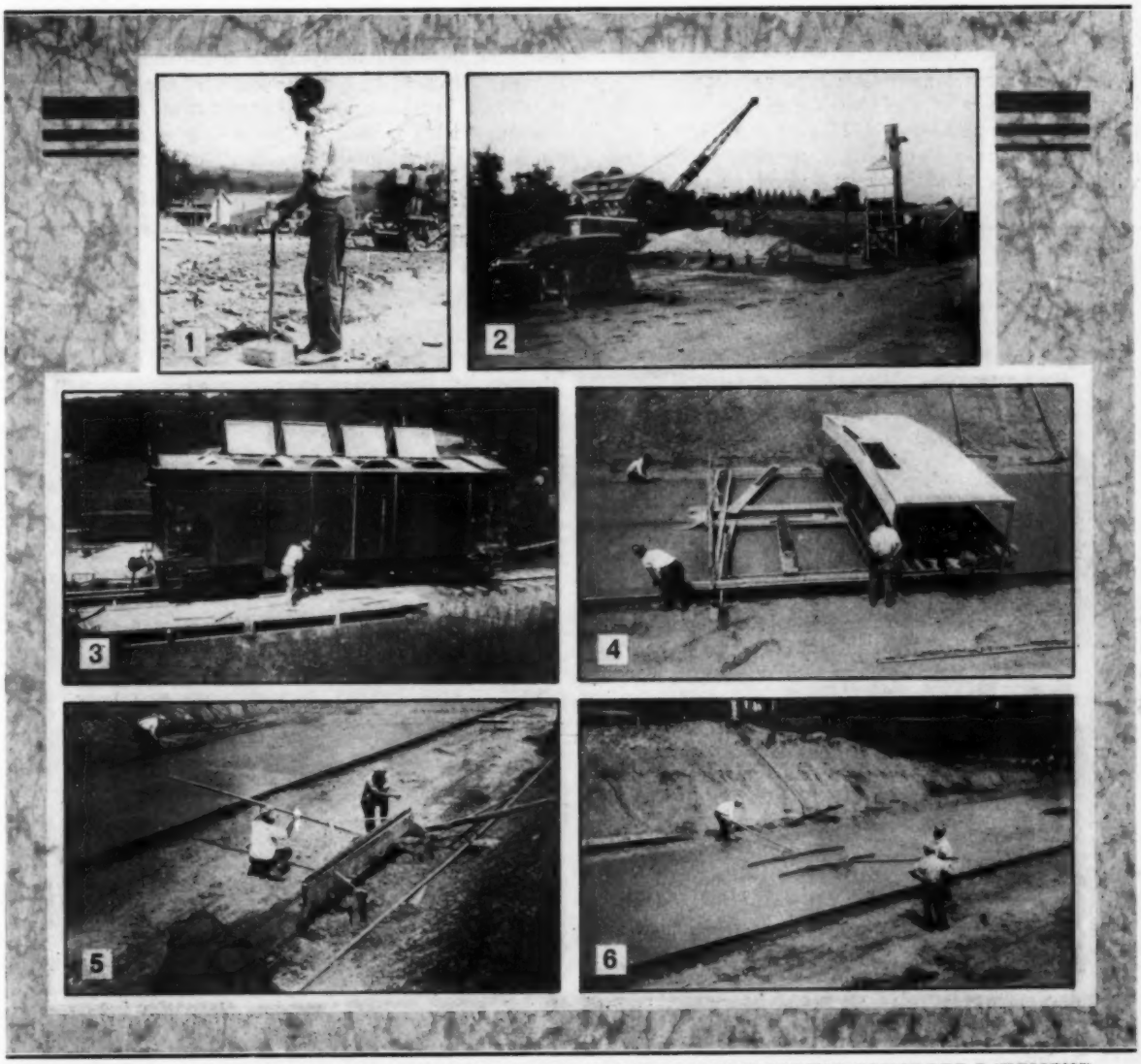
ried the burlap forward on a flatbed truck and placed it on 4 x 4-foot racks of slats to keep out the dirt.

Before the spreading of the burlap the Heltzel Cleft-Plane machine cut the final slot for the pre-moulded center joint material, set the 5-foot strips and finished over the joint, finally dragging a piece of burlap over the section that had been finished to slightly roughen it and make the surface texture similar to the remainder of the pavement.

SOME DETAILS

A novel method, and an inexpensive one, for holding the expansion joint material inside the cap and snug against the steel bulkhead has been developed by this contractor. The cap, which was a part of the bulkhead, was drilled horizontally at intervals across its entire length, giving about twelve points where nails were pushed through the expansion joint material, holding it tight while it was being handled prior to placing on the road. It also insured that the top of the joint would be at the surface of the pavement when the nails were pulled just before the bulkhead was removed. The expansion joint was made up of two pieces, one 10 feet long and 8 inches wide for the section toward the center of the road, and the other cut to fit the contour and hence varying from 8 to 10 inches wide. They were held together by two metal bands at the center.

The pit men on this job were instructed to place the concrete against the Truscon steel center plates and against the expansion joint before the paver reached that section. As for the center plates, this gave a more compact mass against them than the mere flow of the concrete from the bucket. And as the plates had a key at mid-depth it was impossible to spade them with the



SOME OF THE METHODS USED TO SECURE A WELL-BUILT, SMOOTH-RIDING CONCRETE PAVEMENT

1. Hand tamping along the line of the forms to give a firm foundation. 2. The aggregate and cement batching plants. 3. Unloading a bulk cement car at the delivery point about 1½ miles from the batching plants. 4. The center joint machine and hand edgers. 5. Testing one of the 10-foot straight-edges on the master straight-edge. 6. Using the 10-foot drag straight-edges.

same assurance of success as with the straight forms. By placing the concrete against the expansion joint and bulkhead the danger of slight movement of the joint from its vertical position was greatly lessened.

To prevent disturbance of the top of the expansion joint by the strike-off when it was pulled ahead by the tractor, a pair of wooden arcs were set on the steel forms at the location joints. These permitted the strike-off to ride up over the joint. The arcs were of wood and measured about 3½ feet long and 4 inches high. Metal clips, two on each side, held the arcs in place while the strike-off was being pulled over.

A master straight-edge for the constant checking of the drag and checking straight-edges was carried along the shoulder near the finishers. It consisted of a tested 2 x 12-inch plank set in a pair of wooden horses and was well chalked before each test of a straight-edge.

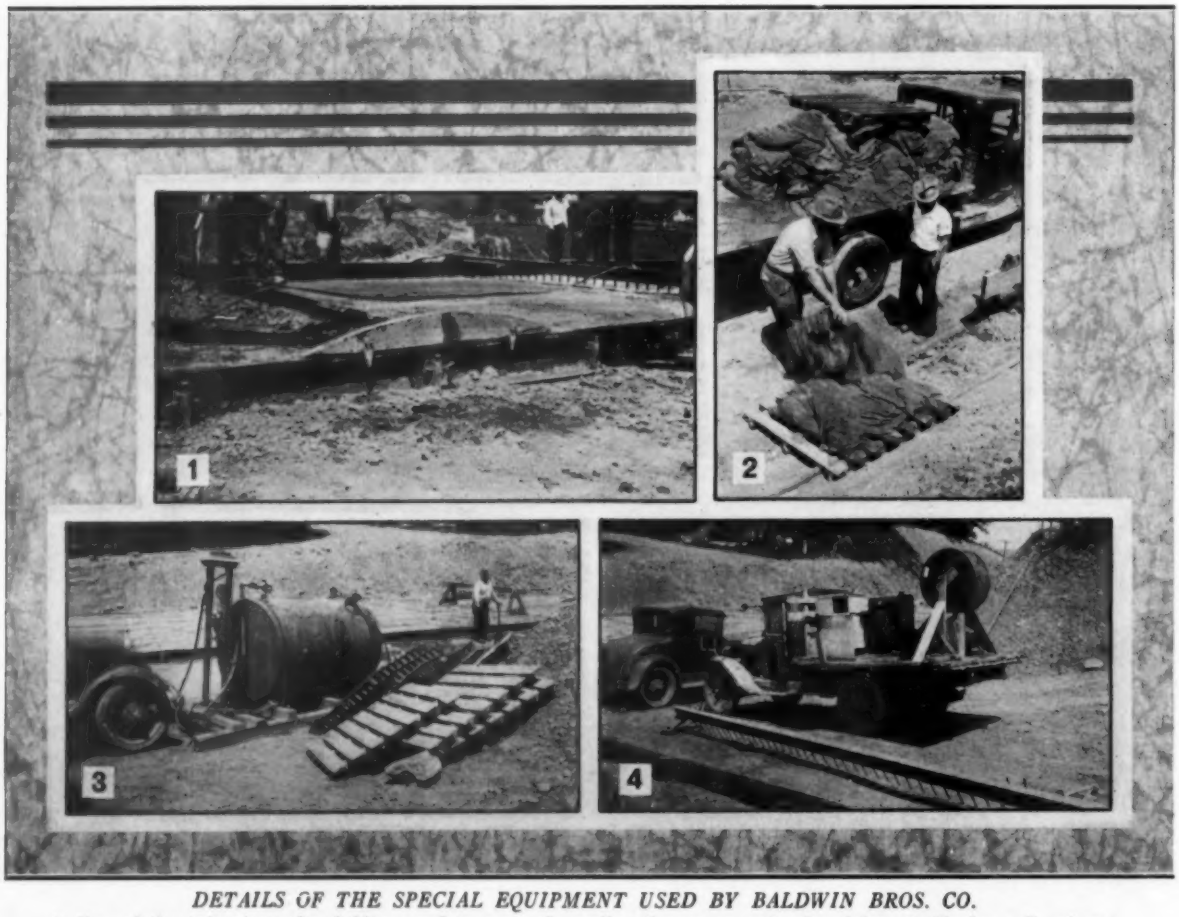
As the season was well advanced toward summer when this job was visited and the sun was hot, the Heltzel Cleft-Plane machine was protected by a canvas cover. Few contractors realize that the work of the men on a machine of this type requires that they lean over all day at their work and thus expose the backs of their necks to the blazing sun. The cost of a cover of canvas or burlap is nothing as compared with the cost of training men to set the center joint material so that it is free of kinks and curves.

The contractor maintained two "roustabout" trucks for hauling burlap, forms, reinforcing mesh and the thousand and one other items that have to be moved from time to time on such a contract. One of these trucks, No. 6, was of particular interest as it was equipped for special service. This truck was run only by the master mechanic and contained the necessary tools for quick repairs and adjustments on the road. It also carried lanterns, and a complete electric generating outfit which could supply current for electric lights along the road when needed. Two 3-foot diameter spools of wire with the light sockets in place were carried at the back of the truck. The generator was powered with a separate Novo engine.

The tool boxes for the various operations along the job were distinctly marked "Paver", etc., so that they would not be mixed up when moved.

A goodly supply of 20 x 20-foot canvas with eyelets and ties was carried on the job as protection against too quick setting of the concrete or damage from heavy showers. It could be quickly laid over the slab at such times as a breakdown which might cause the finishing machine to lag behind the paver. Or if one of those quick and severe thunder showers, for which the middle

(*Continued on page 27*)



DETAILS OF THE SPECIAL EQUIPMENT USED BY BALDWIN BROS. CO.

1. One of the pair of wooden bridges used to carry the strike-off over an expansion joint. 2. Placing rolls of wet burlap on the special roadside racks. 3. A gas tank on skids and a pile of burlap racks stored at a convenient point along the shoulder. 4. The master mechanic's utility truck with its generator and coils of cable.

A New 580-Foot Steel Truss Bridge

Going to Work During High Water

Structure Over Merrimack River at Concord, N. H., Was Delayed by High Water

U. S. ROUTE 3 which leads north from Boston through the White Mountains to the Canadian border carries heavy traffic at all times of the year but particularly in the summer. In order to improve the alignment and also to provide a wider structure of greater capacity, the New Hampshire State Highway Department designed a new bridge which has recently been completed over the Merrimack River at the southern edge of the City of Concord, N. H. It is a steel truss with two spans 168 feet 9 inches long and a main span of 248 feet 6 inches. Work on the substructure was started December 15, 1932, by the C. D. Marsh Construction Co. of Woodsville, N. H.

Substructure Problems

The initial work was the driving of Jones & Laughlin 22-pound steel sheet piling 36 feet long by a McKiernan-Terry No. 7 steam pile hammer to form a 22 x 48-foot cofferdam for the west pier. As the two piers were duplicates, the sheet piling was pulled and redriven for the cofferdam for the east pier. The foundation for the west pier was found to be silt so 58 wood piles with 15 or 28-foot penetration were driven to furnish the foundation. Coarse gravel and boulders formed an adequate base for the east pier. When dewatering the cofferdams prior to excavation, three 6-inch gas-driven centrifugal pumps were used.

Quantities

	WEST ABUTMENT	EAST ABUTMENT
Excavation	335 cubic yards	470 cubic yards
Concrete	129 cubic yards	140 cubic yards
Reinforcing steel	11,000 pounds	11,900 pounds
Rip rap	275 cubic yards	380 cubic yards
Creosoted piling	1,000 linear feet	0
	WEST PIER	EAST PIER
Excavation	290 cubic yards	560 cubic yards
Concrete	495 cubic yards	453 cubic yards
Untreated piles	1,300 linear feet	0
Rip rap	130 cubic yards	315 cubic yards

The entire excavation for the abutments, which ran 14 feet below the stream bed for the west abutment and 15 feet for the east abutment, was done by hand, using about six men shoveling to scale boxes or skips which were handled by a guy derrick.

Pier Footings

Because of the character of the west pier foundation, the engineers of the U. S. Bureau of Public Roads required that steel sheet piling be driven on the neat line of the footing to a depth of 15 to 25 feet below the stream bed to prevent scour. This sheet piling was burned off with an acetylene torch at the elevation of the top of the footing. The pier footings, which were duplicates in size, measured 12 x 40 feet in plan with the west pier footing 9 feet deep and the east pier footing 5 feet deep.

The Derrick and a Few Pieces of Steel Sheeting for the East Pier During High Water

CONCRETING THE PIERS

The piers have round noses and are built with two steps, one at the footing elevation and one 18 feet above the footing or 14 feet below the 2-foot coping. The contractor used ⅞ x 6-inch matched lumber with 4 x 6 wales for forms, spaced and tied with rods and wire and Universal form clamps. The concrete was mixed in a steam-driven 2-bag Marsh-Capron mixer, using a designed mix batched by volume. The batch approximated a 1:2:3½ mix and produced better than a 3,000-pound concrete. The mixer on this job was purchased in 1912. Last year it was equipped with a modern calibrated water tank and is still doing duty after 21 years of service.

A pile trestle was built out from the shore and the mixer set up over the piers, the concrete being delivered through chutes direct to the forms. The trestle was planked and the aggregate stockpiled on the trestle. The concrete crew consisted of fifteen men with two on the sand wheelbarrow, four on stone wheelbarrows, one man emptying the cement into the skip and also running the mixer. The remainder of the crew were spaders who worked inside the forms, treading and spading the concrete. No vibrators were used. The contractor on the substructure, who operated under the 30-hour regulation, ran one crew on a 10-hour day Thursday, Friday and Saturday of one week and Monday, Tuesday and Wednesday of the following week; then placed his second crew on the job on a similar schedule.

SUPERSTRUCTURE CONSTRUCTION

The contract for the steel superstructure was awarded to the Lackawanna Steel Construction Co. of Buffalo, N. Y. The erection of the 618 tons of superstructure was started on April 6, 1933, and riveting completed on July 15, 1933. There was a delay of two weeks in completing the superstructure due to the requirement of the Federal engineers that the west pier be excavated deeper than was originally planned. This contractor worked two crews 30 hours each week with about sixteen men in each crew.

The entire substructure and superstructure construction was tied up for eleven days in the early spring due to high water in the Merrimack River. The river rose to an elevation only 3 feet below the record high water elevation of the 1927 flood which caused so much damage in Vermont and New Hampshire.

POURING THE FLOOR SLAB

The subcontract for the floor slab was awarded by the Lackawanna Steel Construction Co. to F. N. Conant & Sons of Newburyport, Mass. The floor beams of the structure were 33-inch, 132-pound I-beams while the stringers, which measured 18 feet 9 inches in length, were 16-inch 45-pound I-beams. The forms for the floor slab, which measured 7 inches at the curb and 8 inches at the center of the 24-foot clear roadway, were made up of ⅞-inch matched boards held in place by 2 x 4's resting in double wire stirrups which were placed on 20-inch centers. These stirrups fitted over the flange of the stringers and hung down just far enough to allow room for the 2 x 4 with the ⅞-inch form board above it.

The mix for the floor slab was 1:1.7:2.7 batched by volume from washed sand and gravel of 2 inches and under. The concrete crew consisted of two men wheeling sand, four wheeling stone, the operator for the Jaeger two-bag mixer who also emptied the cement, three men wheeling the concrete buggies, and five men placing, screeding and finishing.

There was 70,892 pounds of reinforcing in the slab. This consisted of ¾-inch round rods at right angles to the center line of the structure on 6-inch centers and ½-inch rods parallel to the center line on 18-inch centers. The rods were placed 1 inch from the bottom of the slab with alternate rods bent to give 18-inch segments on the rod at the top and bottom of the slab.

The paving was completed with a 1½-inch bituminous concrete wearing surface after the concrete floor slab had cured.

PERSONNEL

The substructure of the Merrimack River Bridge at Concord, N. H., was built by the C. D. Marsh Construction Co. of Woodsville, N. H., under the personal

Removing the Roadway Forms

The Completed Bridge Over the Merrimack River at Concord, N. H.

direction of C. D. Marsh, President. The superstructure was built by the Lackawanna Steel Construction Co. of Buffalo, N. Y., with T. J. Follette as Superintendent. The subcontractor for the floor slab was F. N. Conant & Sons of Newburyport, Mass., with F. N. Conant as Superintendent. For the New Hampshire State Highway Department the work was under the direction of John W. Childs, Bridge Engineer, with N. S. Stevens as Resident Engineer.

Running a Highway Job with Unemployment Relief Labor

(*Continued from page 24*)

west is well-known, came up the slab could be protected while the men took shelter until the downpour passed.

WATER SUPPLY

As a precaution against any possible breakdown of the water supply the contractor carried two lines of water pipe the entire length of the job. This would be perhaps expensive insurance for a long job but this one was only 3.18 miles. About 6 miles of water line were laid. The water was supplied from creeks at either end of the job, using two Barnes triplex pumps with a C. H. & E. pump in reserve. The taps were placed every 180 to 200 feet in the 2-inch line and the paver carried about 500 feet of hose which was used as two separate hose and connected to the paver by a three-way valve so that no time was lost in shifting from one hose to the other. About 800 feet of ¾-inch sprinkling hose was carried for curing. The paver hose used was Goodall Roadbuilder's hose and the sprinkler an ordinary garden hose.

LUBRICATION

In order to keep the equipment in the best of condition and eliminate as far as possible the breakdown of any machine during working hours, one man was employed to grease and oil all the concrete equipment every night. He used a small truck to travel over the job and carried a supply of 25-pound pails of grease along with him. American Oil Co. greases and oils were used exclusively by this contractor.

PERSONNEL

This 3.18-mile concrete paving job was completed in the specified time by the Baldwin Bros. Co. of Cleveland, Ohio. The work was under the personal direction of F. W. Ewing and J. W. Johnson, members of the firm. For the Pennsylvania Department of Highways S. E. Michaels was Senior Inspector.

Investigation Clears Heavy Trucks of Road Damage Charge

EVIDENCE that motor truck traffic is not entirely responsible for the destruction of roads was given by a Federal official recently in reporting on the condition of an important concrete highway between Richmond, Va., and Washington, D. C. It was found that the use of low grade materials and improper methods of construction were the primary causes of the early failure of the road, rather than the heavy loads of trucks and commercial vehicles, as charged by a railroad official.

H. S. Fairbank, Chief, Division of Information, U. S. Bureau of Public Roads, in reporting on this road, stated, "It was clear that the concrete was of such character that it would have failed under the severe conditions imposed by the character of the subgrade and lack of joints without aid from heavy loads. That the loads were not the primary cause of the trouble was also indicated by the fact that the heavy loads moving over the road are loads which move throughout its entire length between Richmond and Washington and these loads have had no considerable effect upon the sections of the road north of Pohick Church and between Fredericksburg and a point about 8 miles north of Ashland in which sections the concrete was of a character substantially better than in the failed sections.

"The original road was built throughout without longitudinal joints and practically without transverse expansion joints. The surface was apparently laid at many points on green and unconsolidated fills. In consequence of these conditions of its construction, the road has suffered throughout practically its entire length from settlement which has necessitated patching with bituminous material large areas extending completely across the road and has developed a meandering longitudinal crack and numerous transverse cracks, with progressive failure at the intersections of the cracks. Also as a result of the omission of expansion joints there have been blow-ups at many points, the repair of which with bituminous patches presents areas which extend completely across the road in most instances, resembling somewhat the patches over settled areas."

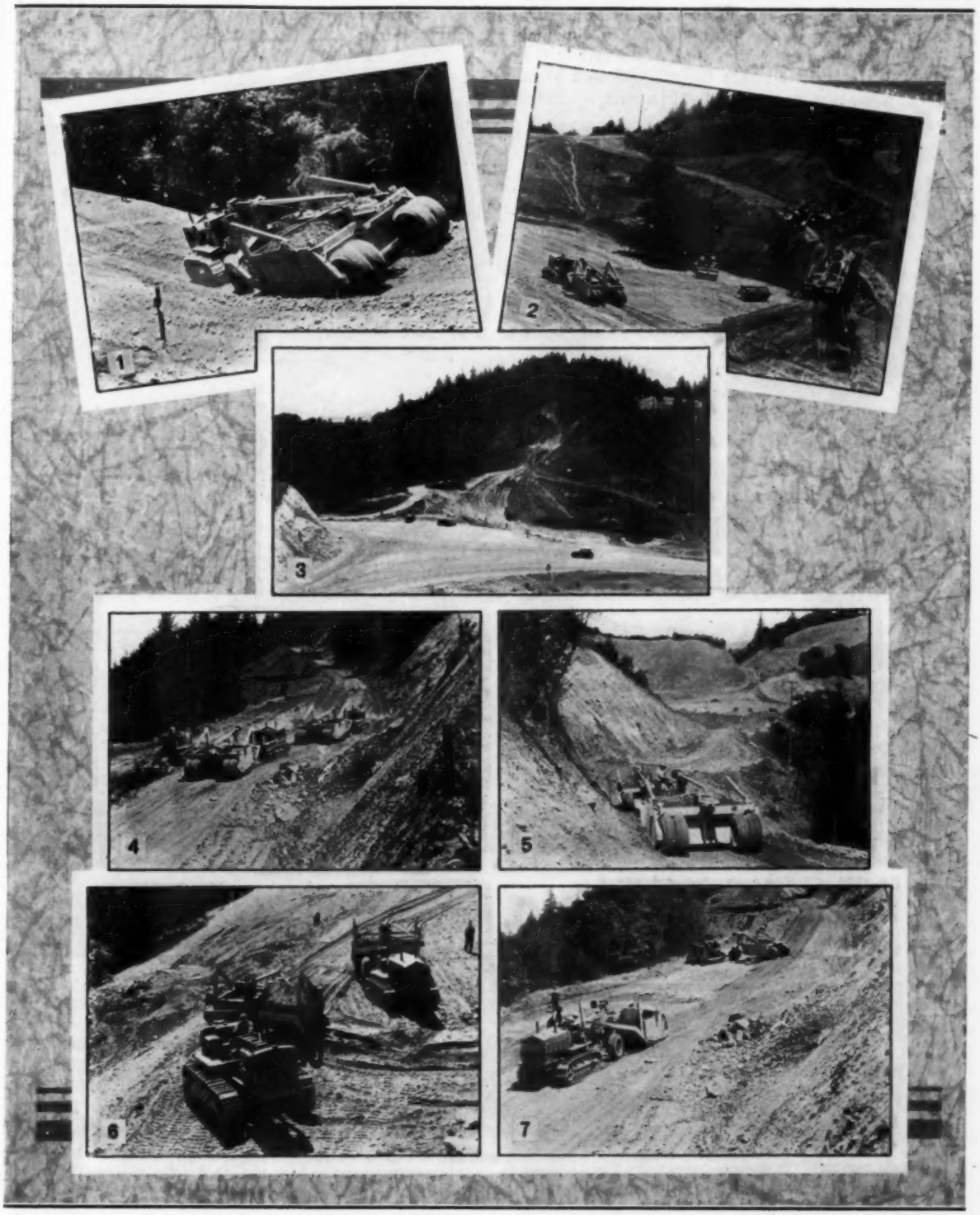
Making Cuts *and* Fills *with* Large Scrapers *on a* California Contract

Union Paving Co. Handles Difficult Grading Job in Unusual Manner with Speed and Efficiency

ALMOST 1,000,000 yards of excavation, with 5,536,700 station-yards of overhaul, is being done almost entirely by scrapers on the Union Paving Co.'s contract on Route 55A between Saratoga Gap and Black Road, in Santa Clara and Santa Cruz Counties, California. Although the material is mainly shale and sandstone, a Le Tourneau rooter is used to break up the extra-hard places and the remainder of the material is handled by Le Tourneau Carry-All scrapers pulled by Cletrac 80 tractors, Caterpillar Seventies and Allis-Chalmers Model L tractors. The project is 6.4 miles long and is located in some of the most rugged country in the Coast Range. The maximum cut on the work is approximately 125 feet and the maximum grade on the finished road is to be 6 per cent.

Work is being carried on simultaneously on two large fills, 2,000 feet apart, and grading is being done as a continuous operation with the scrapers making a round trip from fill to fill and return, picking up a load on each trip through the cut and dumping the loads at either end of the trip. At top efficiency this 4,000-foot round trip haul is being made in 15 minutes. During the course of three days, three of these Carry-All 9-yard scrapers averaged 11 loads per hour on each end of the haul, or 54 cubic yards each per hour, with loads taken at 7.4 cubic yards.

At the northern fill, where the contract joins the Skyline Boulevard from San Francisco to Santa Cruz, the haul is 1,600 feet, of which 1,100 feet is steep construction grade. For 200 feet the gradient here is 25 per cent; for 900 feet it is an average of 12 per cent. Over this 1,100 feet there is a drop of 160 feet, an average grade of 14.5 per cent. The haul at the other end of this work is 400 feet long, with a drop of 50 feet. Over the 1,500-foot end of this work, the scrapers load, haul,



SCENES ON THE UNION PAVING CO. CONTRACT IN SANTA CLARA AND SANTA CRUZ COUNTIES, CALIFORNIA

1. *Dropping a load* 50 *feet over a* 400-*foot haul at the rate of* 110 *cubic yards per hour for each tractor and scraper.* 2. *On this* 1,600-*foot trip over grades averaging* 14.5 *per cent, eleven minutes is required to load, haul, dump and return.* 3. *The intersection of the Union contract and the famous Skyline Boulevard, showing the long haul and grades.* 4. *Scraper units making a* 4,000-*foot round trip haul with delivery at each end in* 15 *minutes.* 5. *Climbing* 160 *feet in* 1,100 *feet.* 6. *A pair of units turning simultaneously on one of the larger fills.* 7. *Carrying a heavy load down a long grade.*

spread and return in 11 minutes. The tractors handle the scrapers up these grades at an average speed of 2.6 miles an hour, part of the climb being made in intermediate gear and part in high gear. Downgrade they average 4 miles an hour. On the 400-foot end of the work the average time for loading, hauling, spreading and returning is 4 minutes.

EQUIPMENT ON THE JOB

The equipment in use on this contract includes one rooter, four 9-yard Carry-All scrapers, one 7-yard semi-drag scraper, three sheepsfoot rollers, all made by R. G. Le Tourneau, Inc., four Cletrac 80's, four Caterpillar Sixties, six Caterpillar Seventies, two Allis-Chalmers Model L tractors, and two gas shovels, one 1-yard and one 1½-yard, which were used mostly for clean-up.

PERSONNEL

This 6.4-mile grading contract for the Division of Highways, California State Department of Public Works, was awarded to the Union Paving Co. of San Francisco, Calif., who bid 21½ cents a yard on excavation and ½ cent per station-yard for overhaul. C. L. Carson is Superintendent for the contractor.

Base Course As Spread by the Finishing Machine

Resurfacing Old Water-Bound Macadam

Seneca Construction Co., Fostoria, Ohio, Laid 8,881 Square Yards of Bituminous Pavement Near Upper Sandusky, Ohio

Close-Up of the Roller Showing the Sprinkling Equipment for the Rolls

The Base Course and the Top Course After the Roller Had Made One Pass Over It

U. S. ROUTE 23 between Marion and Upper Sandusky, Ohio, had an old water-bound macadam surface with an oil-bound tread which was badly worn away. The Ohio State Highway Department awarded a contract to the Seneca Construction Co., Fostoria, Ohio, for the laying of 8,881 square yards of bituminous pavement on this job with a 1⅛-inch binder course as well as 15,733 square yards of 7¼-inch concrete base and 5,717 linear feet of 9 x 18-inch concrete curb. The new pavement is 20 feet wide on a 33.5-foot roadway and is 8.032 miles long. In this distance there were twenty-one curves.

Work was begun at the Upper Sandusky end of the job and progressed approximately 8 miles to a point about 4½ miles from the city of Marion. The comple-

Checking the Base Course Under the Straight-Edge

tion date was scheduled for December 15, 1932, under the contract, but the work was actually completed and the equipment removed to the contractor's yard by November 1. This work was paved under Ohio T-6 specifications and the Amiesite was supplied from a plant operated by Millard-Hunt in Marion, Ohio, and truck-hauled to the job site daily as required.

The trucks dumped into two 8-foot Burch spreader boxes alternately, with two men unloading the trucks and adjusting the spreader boxes so as to get as close to the right amount of materials spread on the road as possible. This was followed up with a 20-foot Ord asphalt finishing machine with six men in front shoveling and two men working behind, raking the edges ready for the roller.

One man checked the surface with a 10-foot straightedge used both longitudinally and transversely. There was one man on the finishing machine and one man on the Hercules Model 100 10-ton 3-wheel gasoline road roller with sprinkler equipment for the rolls, making a total of thirteen men per shift. The contractor laid 4,500 linear feet in two 6-hour shifts, working the roller fifteen hours to complete the 4,500 feet. The specifications called for the use of two road rollers, but the high speed of the Hercules roller used by the contractor enabled him to finish the job in record time. The contractor has many times laid a mile of pavement in 12 hours with this same crew and equipment.

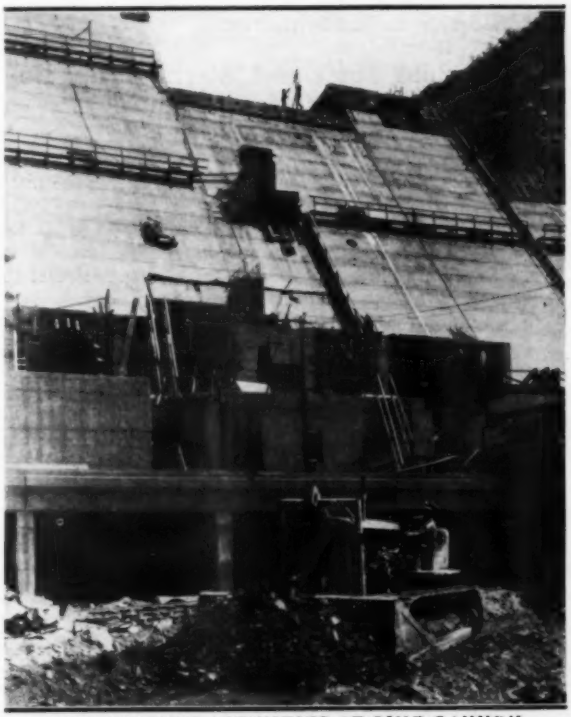
The Importance of Explosives for Construction Projects

NOBEL probably never even dreamed of the great usefulness of dynamite as a tool for the use of engineers, contractors and others for construction projects, though it is certain that its constructive use in such projects would have fitted more nearly into the dreams of the great peace-lover than the destructive use of explosives in war.

Fortunately, the Swedish genius had the satisfaction of seeing dynamite used for making a bore for the 24,000-foot Hoosac Tunnel in Massachusetts for the Troy & Greenfield Railroad. The project probably served as a pattern and an inspiration for the construction of many lengthy bores through mountains in various sections of the country. Among the best-known of such projects are the St. Paul Tunnel, with a length of 8,750 feet, on the line of the Chicago, Milwaukee & St. Paul Railroad near the Montana-Idaho state line; the Moffat Tunnel, 6.11 miles long, under Carona Pass, Continental Divide west of Denver, Colorado; and the Cascade Tunnel between Scenic and Berne, Washington, on the Great Northern Railway. It is an acknowledged fact that the use of explosives made possible the increase in railroad mileage in the United States from 30,000 miles in 1860 to 225,000 miles in 1920.

Without dynamite or some other form of explosive there could not have been built the dams for such purposes as navigation, power, flood control or water supply. For these, explosives are used to prepare the sites, blast rock and supply the raw materials of cement for making the concrete that is used in these examples of modern engineering skill. Without dynamite there could not have been such dams as Gatun, Panama Canal Zone; Wilson Dam at Muscle Shoals; Conowingo on the Susquehanna River in Maryland; the Roosevelt, the Coolidge or the greatest of them all, Boulder Dam, which will tower to a height of 730 feet and will be the world's largest dam.

High explosives have also become essential to highway building. Dynamite makes the cuts, supplies fill material, drains, and otherwise assists in preparing the rights-of-way of the great highway systems of the country. Large quantities of the 100,000,000 tons of crushed stone produced yearly with explosives are used in highway construction. Explosives have an essential part in the annual production of 85,000,000 barrels of cement, a large part of which goes into the building of highways and bridges that span streams. Ore mined with explosives and coal taken from the earth with them make possible the structural steel and the cables for highway bridges. Comparatively recent developments in methods of blasting to accelerate the settlement of fills through unstable areas is another evidence of the great usefulness of dynamite in highway construction.



INTERESTING ACTIVITIES AT PINE CANYON DAM, NEAR AZUSA, CALIF.

At Pine Canyon Dam, H. W. McKinley, Contractor, is moving and spreading rock with this Caterpillar diesel Seventy and LeTourneau bulldozer. The rock is drilled from a shaft under the dam so that a fault in the rock can be plugged with concrete. The rock is removed from the shaft by a compressed air winch and bucket from which it is dumped into a mine car and hauled through the lower entrance gallery. H. W. McKinley reports that it requires 3½ gallons per hour of fuel oil at 3 cents per gallon to operate the tractor on this work.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Interfering with Other Persons' Contracts

The contractor may profitably remember—with a view to the avoidance of stepping on other people's toes as well as to prevent their stepping on his—that there is no rule of law more firmly settled than that no one has a right to induce a person to break a contract. It makes no difference whether the contract be one to marry or to build a house, or a lease or an employment agreeement, or what not.

Competition is open to every one, but the law taboos competition for business that has already been contracted for. When the door has been shut against an unsuccessful competitor, he will do well to look elsewhere, rather than attempt to secure somebody else's contract.

The right of a party to a contract to enjoin an outsider from attempting to induce a breach of it was lately recognized by the Appellate Division of the New York Supreme Court. (251 N. Y. Supp. 259.) That an action for damages for bringing about a breach of an agreement by a contracting party may be successfully maintained by the aggrieved party has been frequently declared by the courts.

Furnishing Inferior Materials May Be Costly in Long Run

"I want 450 sacks of bricklayers' cement for use on the city power plant job," said a contractor to a materialman.

"I'll furnish them for 63 cents per sack," offered the materialman, and the contractor accepted.

Cement was delivered and used in building walls 20 feet high. Then a rain came along and washed the material out from between the bricks, revealing for the first time that the cement was "raw mix," worth 28 cents per sack.

In an opinion handed down May 19, 1931, the Oklahoma Supreme Court decided that the contractor was entitled to be reimbursed for the cost of reconstructing the wall—an amount exceeding several times the contract price of the cement. (Trudgeon v. Patterson, 299 Pac. 419.)

Of course, the decision rests upon a theory that the contractor was excusably ignorant of the fact that "raw mix" had been substituted for the bricklayers' cement bargained for.

Validity of Bonds That Are Unnecessarily Broad

"Sureties," said one Texan to several others, "you signed a bond to the effect that if any one should be hurt on that building while it was being constructed for the state you would see that damages were paid, provided that the injury should be due to fault of my boss, the contractor. Well, I was hurt through his fault and I want my damages."

"But," replied the sureties in unison, "the bond that your boss was required to give by state law was merely to pay for labor and materials."

In the recently decided case of Shade v. Anderson, 36 S. W. 2d, 1041, the Texas Court of Civil Appeals said that, having signed a bond given to cover accidents, the sureties were in no position to say that it was not binding upon them, even if the law did not require the contractor to give so broad a bond.

There seems to be more sense and justice in the decision than in the contention to the contrary that was made on the part of the sureties.

Liability for Injury to Borrowed Equipment

"Here is a bill for what it cost us to repair the portable concrete mixer that we loaned to you, and that was damaged when an automobile rammed into it at night on the highway, all because you left the mixer there without warning lights on it," said the owners of the machine. "Let us have a check for the amount, please."

"Oh, yes?" replied the borrowing contracting company's representative. "Have you forgotten that before that accident happened, we notified you that we were through with the mixer and that you could come and get it?"

"But," rejoined the lenders, "have you forgotten that you said that you would hold the machine for three or four days for cleaning? The hiring agreement required you to clean the mixer."

A lawsuit followed and it was checked up to the New Jersey Supreme Court to decide who must stand the loss. Deciding the case in favor of the owners of the machine, the court said in an opinion handed down June 2, 1931, in the case of Chas. W. Mathis & Sons v. Cranmer, 155 Atl. 129:

"It was open to the jury to find that the date [of the accident] was as alleged in the complaint, and consequently that it [the machine] was still in the possession and control of defendant. Its duty was, therefore, to use ordinary care to see that the machine was properly placed and lighted at night to the end that it should not, in the negligent sense, interfere to their injury with those having occasion lawfully to use the highway, and that it should be reasonably safeguarded from breakage due to such negligence."

What Is the Contractor's Compensation Right When He Is Wrongfully Prevented from Completing a Job?

"You don't mean to tell me that you expect to make as much profit out of that contract as you would have made if I had permitted you to go ahead and complete the job, do you?" asked an owner, when he found that the contractor was not disposed to content himself with payment for work actually completed before wrongful dismissal by the owner.

"Who knows that there would have been any profit?" persisted the owner. "Fire, accident, labor troubles, or any one of the million other misfortunes that are apt to overtake a contractor, might have put you 'in the red,' had I not rescued you by calling the job off."

"My lawyer tells me," replied the contractor, "that the law does not look at things the same way that you do—that I am entitled to whatever profit it is reasonably certain I would have made had you lived up to the terms of your bargain."

It looks as if the contractor's lawyer was right, because in an opinion filed April 13, 1931, by the Pennsylvania Supreme Court, in the case of Hottinger v. Hoffman-Henon Co., 154 Atl. 598, that tribunal said:

"Where a contractor has partly performed an entire contract, and is prevented from completing performance by the act of the other party or by law, we have said that he may recover in an action on the contract, and the measure of his damage is the contract price, less the reasonable cost of completing the work."

The Editor Comments

Signs of a United Industry

William Randolph Hearst has set the fashion for razzing the N R A and well one may, if he feels that in seven months a new administration should so re-deal all the cards that we should be completely revived after the business starvation we have known for three and a half years.

In the first place, the new group had to organize. It was so elated over its unprecedented victory that it publicized its belief that the New Deal represented the millenium and Business and Taxpayers believed it. Trade boomed on news of the birth of N R A until it was discovered that N R A must be played like any good investment—for the long pull instead of for quick speculative profits.

Let us bring the discussion of N R A right to our own hearthstone—the Construction Industry, including manufacturer, distributor, contractor, engineer, architect, financier, and the buyer, whether it be private enterprise, State, County, City or the Federal Government itself. Has N R A anything worth a "tinker's dam" for us? An answer is found in the address made by S. F. Voorhees, architect and engineer of New York, and Chairman of the Code Committee of the Construction League of the United States, before the Metropolitan Section, American Society of Civil Engineers in New York, October 18. Mr. Voorhees said: ". . . . we are at the beginning not only of a very vital experiment, but of a very great adventure. I am very sure that this new era upon which we are entering, so far as our government is concerned, may lead even, according to the prediction of a very deep student of political government, to a position where industrial government will at least be equal in importance, or perhaps exceed, our present territorial representative government. . . . We must not think of the present increased wages, shortened hours, getting out of this hole—that is a part of it and an important thing—but far beyond that and of far greater importance to my mind is the setting up of a proper industrial self-government. We have the opportunity and every one of us must make it go."

The Basic Code of the Construction Industry has been through nearly a dozen revisions, each building it better, for permanence and fairness. The nearly a score of supplementary codes representing the various phases of construction activity are undergoing a similar evolution to make them fair to all. Labor has had to be reckoned with and has been somewhat antagonistic. These have been times to try the patience of a modern Job. Industry and contractors have lost their tempers and their hearts, but a group of patient men is carrying on in Washington to complete the creation of a Code, a constitution and by-laws for our Industry, which will for the first time knit all interests together into a harmonious whole. Whether N R A lives beyond its first birthday or not, the Construction Industry will have been united and under its own Code flag will carry on with less waste, less unfair practices and less acrimonious accusations, as the country's most substantial and fundamental industry to recreate and stabilize that most desirable condition—a temperate prosperity.

A Still Greater Volume of Construction Needed

Construction—a Billion-Dollar Industry used to be our boast, but it is sadly shrunken today until the main prop left is the $3,300,000,000 now being spent by the States for highways and by Federal Departments for everything from chicken coops to complete power projects and lots of things in between which a few months ago would never have been considered public works.

Why isn't the volume of construction greater and how could it be greater? First, private construction or construction by industry is nil; banks won't loan the money for it and in boom times industry, that is general industry, overbuilt ridiculously. There is a strong feeling, however, that stimulated by the loans of the P W A to the semi-public housing corporations, banks will loosen up with funds secured through selling preferred or capital notes to the government, and we shall see a larger volume of building very soon.

The second reason for such a lack of highway and municipal construction, and also for much of the delay in the Federal-financed construction, has been the "cagey" attitude of states and cities. Many were in a financial position to carry on their well-conceived programs of construction through their own bond issues. All praise to those which did! But most of them saw the 30 per cent grant and the low interest rate for loans offered by the P W A, reconsidered their existing programs and revamped them to make use of the proffered Federal funds. How much better it would be to use the Federal money to supplement the then existing programs and thus increase employment to a far greater extent instead of merely swapping one source of money for another.

Theodore Reed Kendall

How the Other Fellow Did It

Ideas That Have Already Proved Helpful to Contractors

Contractor Builds Tool and Work Shed That Is Salable

266. Most construction shacks which house the tools, material and contractor's office are built to be torn down or otherwise destroyed at the end of the job. A Tennessee contractor has developed a standard type of shed which he finds most useful in fair weather and foul and which he has been able to sell to a nearby farmer at the end of practically every contract. The particular shed we inspected had space for the storage of about 1,000 bags of cement and a tool room on the northwest corner. The main feature, however, was the wide roof which extended out about 25 feet on the south side. Under this shed the saw rig was located and here in rainy weather the carpenters made up all the forms, thus saving a great deal of time. Later, as the form work was completed, the shed was used for the hand finishers on the rail spindles who sat at a long bench and rubbed the concrete to a smooth finish. *25.2.25*

What Manner of Chute for Bulk Cement?

267. Of course the best way to deliver bulk cement to a batch truck is through a large flexible rubber tube as this prevents flying dust and possible loss of cement. Better still is the delivery to a suitable separate container for the cement so arranged that the air can go out of one side of the container as the cement flows in the other. There are thousands of bulk cement docks built every year by contractors who have not yet seen the light and invested in one of the commercial cement batching plants. Various methods are used to restrict the flow of the cement from the cart onto the batch but most of these permit a large amount of cement to fly into the air. One which worked admirably was a trap built up of 1 x 8-inch planks with two laid on top to act as tracks. The inside of the trap was lined with sheet metal to prevent, as far as possible, sticking of the cement to the trap. Canvas slightly constricted where it went into the truck body was used to prevent scattering of the cement when it was dumped through the trap onto the batch. Note the "slightly constricted" as that is the secret of keeping the cement on the batch. When the trap was lifted such cement as was held within the canvas skirt could flow gently out over the top of the batch. But where the canvas is loose the cement is bound to fly when the cart is dumped. *25.3.33*

A Proof of the Value of Truck Maintenance

268. A Baltimore contractor who prides himself on the maintenance of his heavy-duty motor trucks has trucks which have been in service hauling heavy rock and dirt for eleven years. As a very pertinent comment on the value of careful maintenance and constant checking by master mechanics, the contractor reported a foundation contract which he handled recently. This foundation was excavated to a depth of 50 feet below the adjacent street level, and it was necessary for the trucks to haul the dirt up a very steep ramp in order to reach the street. At this time most of the contractor's trucks were busy on other operations, and he was compelled to hire ten trucks to do the hauling. Only one of these ten hired trucks, which incidentally were of the same make as the contractor's own trucks, was able to pull up the steep ramp, and that truck was about five weeks old. The contractor then used his own trucks, and every one used made the grade. *25.3.19*

Isaac Walton, Contractor

269. On paving projects where the contractor produces and washes his own sand and gravel, there is always the problem of water supply. In the particular case in mind, the water supply problem was not that of securing sufficient water but of disposing of the water in such a way as not to damage a popular trout stream nearby. The continual running of the muddy wash water into the stream would have soon put an end to the trout. Consequently a long earth dike was thrown up around an area of about one acre into which the wash water was run throughout the day. Such water as did seep through the dike was clear and did no harm. Overnight the pond settled and each morning before the plant was started up, four 6-inch pipes were opened and the clear water drained off into the trout stream. Perhaps this contractor was a member of the Isaac Walton League. *25.2.22*

Gang Moulds for Spindles

270. Most states have standard moulds for the spindles of bridge hand rails. A contractor in Tennessee cast these hand-rail spindles in gang moulds of ten at a time, using four moulds so that the day's production was forty spindles. These gang moulds were made from standard ¼-inch plate spacers which fitted into grooves in the side plates. Thus it was possible to pour the ten in one mould with the spindles on end and a slight tapping of the mould insured a complete absence of honeycomb. A single reinforcing rod through the center of the spindle facilitated the handling of the unit and tied it into the hand rail. The gang moulds were made by countersinking the heads of stove bolts in the plates and carrying them out through the heavy planks on the outside of the moulds. To give the best possible finish, the spindles were hand rubbed with Carborundum bricks at benches. *25.2.28*

Quick Moving of the Paver Hose

271. On a concrete job where a 27-E paver was in use, the contractor used two 1½-inch paver hose each 300 feet long. With taps set every 340 feet in the 2-inch water pipe, shifts were not frequent and when they were necessary the contractor saw to it that they were not arduous tasks which required that all the grading and concrete crew lay down their tools and rush the hose from one tap to another. Each hose carried a complete coupling and the extra hose was pulled ahead by the very busy utility truck and attached to the next tap. Then when it came time to shift hose, all that was necessary was to pull the end of the new hose across the slab, cut out the old hose and attach the new while the skip was up. *25.3.18*

Mud Sills from Rejected Aggregate

272. Mud sills are usually made of old lumber which will adequately spread the weight of the falsework over the unstable foundation material. A Tennessee contractor economized on lumber by carrying the forms for the four girders for a concrete bridge on concrete mud sills, using the sand and gravel that had been mixed with dirt and could not be used in the structure as aggregate for the sills. These rough footings for the posts were used for all but two of the spans on a long structure in central Tennessee and supported the timber posts which carried the 6 x 8-inch oak caps and 5 x 12-inch oak stringers 14 feet long. Oak wedges were used to take up any settlement in the forms during pouring. *25.2.26*

Construction Industry News

American Road Builders' Association has announced that its 1934 Convention and Highway Exhibit will be held the week of January 22, 1934, at the Stevens Hotel, Chicago, Ill.

R. G. Le Tourneau, Inc., Stockton, Calif., manufacturer of heavy-duty earth moving equipment, has announced the appointment of a new sales engineer, J. H. Heinmiller, for Nevada, Utah, Arizona and New Mexico. Mr. Heinmiller was formerly a Le Tourneau employe and is an experienced road and railroad grading expert.

J. Shuman Hower, of Utica, N. Y., a well-known equipment distributor, has moved to new offices in his large warehouse at the corner of N. Genessee St. and Wurz Ave., Utica, N. Y. The warehouse, which is well stocked, has been renovated and large new show windows installed. Its location is convenient, being next to the office building of the State Department of Public Works, opposite the N.Y.C. Freight Station, on the Albany-Buffalo Route 5, and the rear entrance adjoins the Barge Terminal.

American Manganese Steel Co., Inc., Chicago Heights, Ill., has announced that W. K. Leach, formerly with General Alloys Co., of Boston, Mass., is now associated with it as General Manager of the Alloy Division, 6600 Ridge Avenue, St. Louis, Mo.

Barber-Greene Co., Aurora, Ill., has recently appointed the Syracuse Supply Co., 314-18 West Fayette St., Syracuse, N. Y., as its exclusive distributor for conveyors, car unloaders and bucket loaders in central New York.

Indiana Equipment Co., Inc., 327-29 W. Market St., Indianapolis, Ind., has been formed, merging all of the former Shearer & Mayer accounts and has also been appointed distributor for the Caterpillar Tractor Co. and allied lines in the thirty-two counties comprising the central Indiana territory.

Continental Roll & Steel Foundry Co., Industrial Equipment Division, 332 So. Michigan Ave., Chicago, Ill., has acquired the manufacturing rights for the well-known Wooldridge line of dirt-moving equipment. Continental-Wooldridge machines are now being manufactured for all crawler tractors by the Industrial Equipment Division, R. W. Moon, Manager.

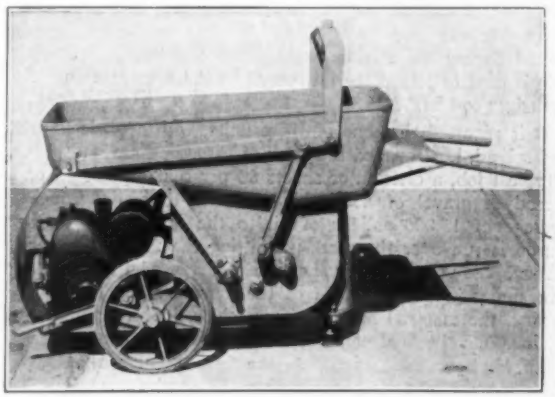
Robert S. Hale Co., consultants on the welding of steel structures and the remodelling and reinforcing of existing structures by welding, has announced the removal of its office from the Old Colony Bldg., to 1432 W. Lake St., Chicago, Ill.

Lansdale Structural Steel & Machine Co., a new corporation with general offices at Lansdale, Pa., has been formed under the laws of Pennsylvania and has purchased the steel fabricating plant at Lansdale formerly operated by the Kirby Iron Works which is completely equipped with machinery and electric cranes. Joseph Roberts, formerly designing engineer for Proctor & Schwartz, Philadelphia, is President and Chief Engineer of the new company and Norman P. Farrar, formerly Sales Manager of Harnischfeger Corp., is Vice President and Treasurer. The business of the new company will be the manufacture of steel frame structures and machinery as well as steel erection.

A New Device for Raising Sunken Sidewalks and Pavements

THE Mud-Jack, now so well-known to highway builders as the machine which pumps a mixture of mud and cement beneath sunken slabs of highways and jacks them up to grade, has been supplemented by a new and smaller unit applicable to the lifting of sunken sidewalks, curbs and gutters. This Mud-Jack made by the National Equipment Corp., Milwaukee, Wis., is a special pump which forces mud under pressure through holes in the slab of concrete to be raised. Employment of the jack entails the use of a rotary drill operated by an air compressor which cuts holes about 2½ inches in diameter into the concrete. A mixture of black soil, water and cement is then forced into the holes by the jack.

The principle involved is the exertion of a small amount of pressure per square inch on the entire area of the slab to be raised, creating great lifting power. The machine, no more than 3 feet high, raises to established grades large slabs of concrete that sometimes weigh several tons. The first of the new smaller units was purchased by Shorewood, Wis., and has been used by that municipality for raising sunken sidewalks, curbs and gutters. This is work which may be done either by a city with its own forces or by contractors who operate over a large area.

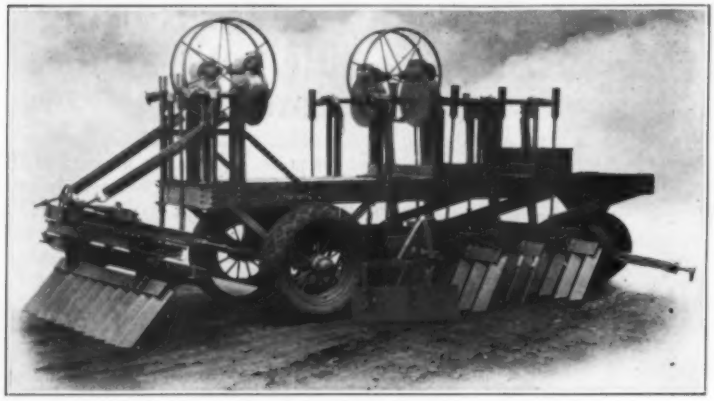


The New Mud-Jack for Raising Sidewalks

A. S. T. M. Manual on Presentation of Data

THE A. S. T. M. Manual on Presentation of Data, which has recently been issued, was prepared by a special committee of engineers, who are at the same time statistical experts, to correlate and make available in a convenient form some of the principles of efficient presentation of data. The Manual discusses the application of statistical methods to the problems of condensing information contained in a set of observations and presenting the essential information in a concise form more readily interpretable than the unorganized mass of original data. Attention is directed particularly to quantitative information on measurable characteristics of materials and manufactured products. There are also given in the Manual critical comments on various methods used in presenting data, a discussion of what relevant information should accompany the data and the Committee's recommendations for data presentation.

The Manual comprises 45 pages and copies can be obtained from the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Price: 50 cents.



The Parsons Black-Top Machine

A Black-Top Machine for Mixed-in-Place Work

THE Parsons Turbo-Mixer, which consists of batteries of angular vanes which ride on the subgrade and bring the fines up through the oil, giving a true and rapid mixing action, has been developed by the Parsons Co., Inc., Newton, Iowa. The rear unit of the mixer includes a cross-mix blade which can be put in action where any streakiness appears. It can also be used for leveling and trimming the spread during the mixing process. A trimmer on the right side is used to return the oil run-off to the aggregate and trim the edges to line.

It is reported that one of these units, with a blade to trim and spread, has equalled the work of three or four blades. On a typical job, a distributor shoots 80 per cent asphalt oil on a spread of gravel of 850 cubic yards to the mile, using an average of 15,000 gallons of oil to the mile. The Parsons Turbo is run over the road, permitting the material to surge through the vanes. The vanes are so arranged that there are five surges in each traverse of the machine. At the end of mixing, the material has a uniform color, indicating thorough mixing. On the final passage, the material is left in numerous small windrows which facilitate the final spread with a patrol blade, ahead of rolling or leaving the road for packing by traffic.

The Parsons Turbo-Mixer and Agitator is 22 feet long, 8 feet 6 inches wide and stands a maximum of 8 feet in height. It has a wheel base of 12 feet 6 inches and the vanes cover a width of 8 feet 6 inches of road. The rear spreader blade is 12 feet long and 1 foot 10 inches deep. The machine, fully equipped, weighs approximately 8,000 pounds.

Improving the Power of Old and New Motor Trucks

A DEVICE for testing the power of motor trucks by automatic analysis of the exhaust gas from the engine has been developed by Cities Service, Room 781, 60 Wall St., New York City. The Cities Service Power Prover was first announced a year ago and has been used by thousands of motorists, fleet owners and others in finding in a few moments just why the engine is not pulling as it did when new.

The Power Prover is an instrument which, in the hands of the ordinary mechanic, accurately analyzes the potential fuel remaining in the exhaust gases. Then to correct expertly and intelligently the faults which are discovered through the exhaust pipe, a comprehensive 23-step tuning routine was developed to aid the mechanic in making practical and accurate motor adjustments. The instrument itself takes a sample of the exhaust gas, either by mechanical or water suction, and then these gases are liquidly cleaned and cooled to eliminate condensation and are then dry-filtered. The sample is then reduced to a standard quantity or volume and to this sample is added a standard quantity of air sufficient to insure thorough combustion of the sample when ignited. The combined sample and air are thoroughly mixed prior to ignition.

To accomplish ignition of this very thin mixture, an unusual method which operates very simply was developed. A galvanometer dial, which reads automatically in combustion efficiency, tells the operator within 30 seconds the combustion efficiency with which the motor being tested is operating. He, therefore, has at a glance analyzed the efficiency of the prime function of an engine, its ability to use effectively the heat supplied.

The next thing to do is to correct the condition, after its direct cause has been found. This brought out the systematic tuning routine, and a set of distinctive and specially designed tuning tools.

The Federal Concrete Co., of Buffalo, N. Y., had a gasoline-powered locomotive on a large construction job. Hard starting was a grave problem. For two years, during which a premium gasoline was used, it was impossible to start the motor by means of the starter. The locomotive would get under way only after it was pushed by a steam crane. Since it was Power Proved, however, it has responded quickly and easily to the starter, operating satisfactorily all day long on a straight run gasoline. The saving in gasoline alone amounts to 3 cents a gallon. In addition the locomotive can now easily move three gondola cars loaded with sand and gravel, where previously it could move but two.

Cities Service has arranged to place a Power Prover in the hands of any contractor operating a fleet of motor trucks, who uses Cities Service gasoline and lubricant exclusively.

Light-Weight Wheelbarrows of Aluminum

ALUMINUM alloy wheelbarrows, which are claimed to weigh less than half those of steel, are made by the Sheet Aluminum Corp., Jackson, Mich. These wheelbarrows have the tray and frames made of aluminum alloys, with wood handles, anti-friction bearings in the wheel, and pneumatic tires. The light weight makes possible increased pay loads with less fatigue on the operator and the pneumatic tire makes it possible to use the barrows without runway planking in many cases.

The New Aluminum 4½-Cubic Foot Wheelbarrow Which Is Equipped with a Pneumatic-Tired Wheel

A Duraguard Plate After a Test with a 3,700-Pound Sedan

A Resilient Highway Guard-Rail Plate

A RESILIENT highway guard rail which yields slightly when struck by a car and then by its reflex action throws the front end of the automobile back, at the same time straightening the wheel so that the course of the machine is parallel to the guard, has been developed by the Truscon Steel Co., Youngstown, Ohio. The Truscon Duraguard has high visibility, as the white posts with the continuous band of galvanized or white-painted steel, 12 inches wide, stand out clearly against any background, either in broad daylight or dark night.

There are two types of brackets for mounting Duraguard. Bracket D-1 is a rigid bracket especially adaptable to rigid steel uprights on bridges and viaducts while bracket DC-1 is a cushion bracket adaptable to all general guard rail uses. The plates are 12 inches wide of a gage as specified with reinforced end connections fitting either the rigid or the cushion bracket type as well as with end post and bridge end connections. The sheets are so fabricated that they will take care of expansion and contraction as well as serve to keep the entire section of guard rail in tension at all times. The manufacturer recommends that guard rail posts whether steel, concrete or wood, be set at least 4 feet in the ground and that the guard rail be not more than 12 inches above the grade line and also that the post does not extend above the guard rail more than 1 inch.

Unless otherwise specified all Duraguard sections are sold in standard lengths requiring post spacing 16 feet on center except the end sections which are 8 feet on center. The intermediate sections measure exactly 15 feet 11¾ inches and the end sections 7 feet 6 inches.

A Crawler-Mounted Welder

A SELF-PROPELLED crawler-mounted welder, which is especially adaptable for repairing old bridges, building new ones, and other work requiring a mobile welding unit which can work in a comparatively small space, has been announced by Schramm, Inc., West Chester, Pa. The entire unit is mounted on a one-piece steel frame which is housed on the sides and bottom with ½-inch heavy steel plate. The ends and the sides are provided with louvres to give a free flow of air through the outfit and all parts of the unit are easily accessible because of the removable sliding doors on the sides. The heavy-gage metal top is swung open while running or when adjustments are necessary.

The endless traction treads, which are each 8 inches long and 8 inches wide, run on heavy cast steel sprocket wheels and the tread rollers run on steel tracks. Adjustment of the tread is by means of the adjustable front sprocket axle which may be easily moved by turning one adjusting screw on each side of the chassis.

Power for propelling the Trac-Weld is secured from two 3-horsepower 115-volt D.C. reversible motors that drive to the traction tread by means of an alloy steel roller chain. The speed of the motors and the steering of the outfit are controlled by two levers conveniently located on both sides of the driver's seat. An average speed of 1 to 1½ miles per hour can be maintained, either forward or reverse, and the turning radius can be confined to a very small area. Included in the general accessories is a 7½-kw General Electric 115-volt generator which is used to operate the two G. E. motors for self-propulsion and can also be used for the operation of electric grinders, drills and similar tools.

The G. E. welder which is used in these units is of the 300-ampere single arc or double arc type.

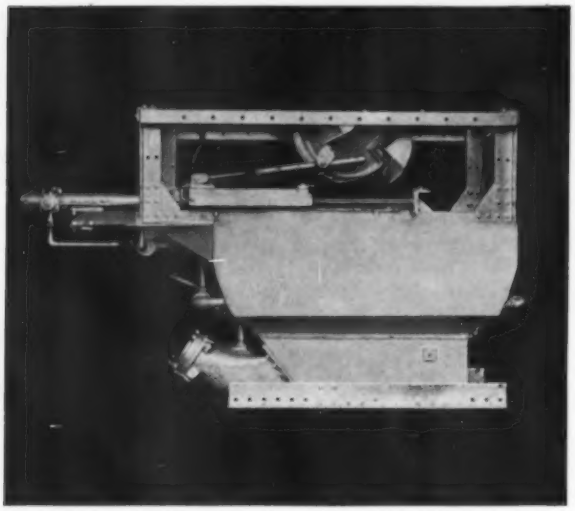
Using Trucks for Maintenance and Fine Grade Rolling

BY the development of an auxiliary roller wheel which can be used with dual pneumatic-tired trucks, the New England Metal Culvert Co., 10 Alger St., Boston, Mass., makes it possible to use the standard maintenance truck or the contractor's utility truck for rolling shoulders or fine grade. The Lawrence auxiliary roller wheel is attached to any light truck, converting it into a 6-ton roller giving a compression of 240 pounds per square inch.

This Lawrence auxiliary roller wheel consists of a wide steel band which fits over the rear wheels of a dual-pneumatic truck and is held in place by means of flanges between the sets of tires. It does not affect the riding or traveling qualities of the truck at a reasonable speed and may be left on or removed with little effort.

To install the maintenance roller, both rear tires are deflated and the outside wheel removed. The auxiliary roller wheel is then slid over the deflated tire of the inside wheel, leaving the lugs sufficiently clear to prevent pressure against the side of the tire when inflated. The outside wheel is then replaced and both tires are inflated to normal pressure. The unit is then ready to put onto the road for smoothing and compressing patches, rolling shoulders and rolling and compressing of coverings applied after seal coats of bituminous material. It has also been used in connection with the construction of gravel, bituminous macadam and retread bituminous-mix roads of moderate size. It can be used effectively for rolling fine grade prior to the pouring of concrete slab.

The Lawrence Auxiliary Roller Wheel



The Press-Weld Pneumatic Concrete Placer

A Pneumatic Concrete Placer

A PNEUMATIC concrete placer designed particularly for working in close quarters in tunnels and which delivers charges of concrete into the form in very rapid succession, as rapidly as a charge every 30 seconds, has been developed by the Pressed & Welded Products Co., Box 4622, Pittsburgh, Pa. One operator manipulates two valves, one for charging and one for discharging. The charging valve controls the piston which operates the upper gate opening and closes off the concrete storage bin above the placer. This gate interlocks the sliding gate below which opens and closes the placer. These gates are operated automatically, in proper sequence, in order to charge the concrete into the placer properly.

The discharge valve controls the discharging of the concrete through a flapper gate and air mixing chamber in the bottom of the placer in such a manner that the charge is delivered through the machine in a few seconds, operating efficiently with as low as 40 to 60 pounds air pressure, depending upon the length of the discharge pipe. The manufacturer claims greater capacity, economy, speed and safety in operation for this machine.

Impregnating and Coating Mineral Aggregate for Bituminous Paving

A NEW plant for producing impregnated and coated mineral aggregate for bituminous paving has been developed by the Heedicsite Co., Grand Rapids, Mich. The purpose of the Heedicsite manufacturing plant is to heat, expand, dry, impregnate, coat and seal the particles of mineral aggregate of any desired sizes, or combination of sizes with bituminous material to produce a finished bituminous mixture for street and road paving. The principle parts of the plant are a horizontal, cylindrical, rotary drier 4 feet 8 inches in diameter and 24 feet long, provided with tracks around its outer periphery which support the drier on roller bearings. On the inside are twelve 8-inch I-beams for elevating and cascading the rock as it passes through the drier. The drier is provided with a continuous bucket-type elevator at its receiving end for delivering the rock aggregate and also has an exhaust fan for removing the moisture and products of combustion.

The rock aggregate is discharged from the drier onto a 3-stage vibrating screen, mounted directly below the drier and above a 3-compartment storage bin for separating the rock aggregate into predetermined sizes, and for cooling. Each of the compartments of the storage bin is provided with a horizontal, adjustable outlet gate for governing the rate of flow of the rock aggregate from it.

Immediately below the storage bin is a horizontal 30-inch belt conveyor divided into three strips by means of 12-inch steel vertical skirt boards. Each of these strips is provided with an adjustable transverse measuring gate, which permits a predetermined quantity of the separate sizes of rock to pass under it.

The horizontal steam jacketed pug-mill is 15 feet long, 24¼ inches in diameter and 28 inches high and equipped with a 6-inch shaft on which are mounted 70 adjustable blades which mix and agitate the material as it travels through the pug-mill. Two rotary faucets are provided for handling the asphalt and spraying it onto the bituminous material as it enters the pug-mill and there are two 10,000-gallon storage tanks for the asphalt. The rotary faucets automatically measure and forcibly eject the asphalt from the storage tanks onto the rock aggregate while it is in agitation. The plant has a rated capacity of 80,000 pounds of finished mixture per hour.

A Power Spray Outfit for Curing Concrete Roads

A POWER spray outfit which includes a tank and power pump mounted on rubber tired wheels and a separate spray unit has been developed by the Aeroil Burner Co., Inc., Park Ave. at 13th St., West New York, N. J., for applying bituminous materials to concrete roads for curing or for color coating. The spray boom is 12 feet wide with an apron 10 feet wide and is mounted on three rubber tired wheels. The spray bar can be shortened for 10 or 11-foot roads and is provided with attachments to spray the sides of concrete slabs. Standard equipment includes 18 hardened-steel spray nozzles. The air and liquid control valves are provided near the spray boom for the operator.

The power unit is a 5-hp air-cooled engine with a speed regulator and hand starter. It has a 2-cylinder heavy-duty air-cooled roller-bearing air compressor driven by three V belts and has a capacity of approximately 25 cubic feet of free air per minute. It is mounted on a channel iron base with the 120-gallon capacity welded steel tank which has two air relief valves, a pressure gage and two shut-off valves. These are mounted on a trailer with four 4.00 x 18 pneumatic-tired, roller-bearing steel wheels with the front wheels swiveled to permit sharp turns. The outfit is equipped with two 25-foot lengths of high pressure air and solvent hose with bronze unions and ground joints.

The Aeroil Power Spray Outfit Curing Concrete

Barrett Tarvia

GOOD ROADS at LOW COST

Constructing Glenside Avenue, Watchung Reservation, near Summit, New Jersey. Tarvia-lithic.

The completed road—easy-riding, skid-safe, all-weather.

Both photographs were taken in December, 1932.

GLENSIDE AVENUE, near Summit, New Jersey, is typical of what can be done with Tarvia or Tarvia-lithic and Barrett service—even under adverse conditions.

Tarvia-lithic construction was begun in December, 1932, and carried on through the winter. Inexperienced labor was used, drawn from the ranks of the unemployed, and the result was a completely satisfactory, easy-riding, skid-safe, all-weather pavement.

If you have urgent construction, maintenance or repair work to do, it may not be necessary to wait until spring, even though the road season is "officially closed." Tarvia and Tarvia-lithic can be successfully applied in almost any weather except actual snow or rain.

Talk it over with the Tarvia field man. He will tell you how Barrett's speedy and dependable service can help you. 'Phone, wire or write our nearest office.

The Barrett Company

New York	Chicago	Philadelphia
St. Louis	Minneapolis	Boston
Detroit	Cleveland	Hartford
Buffalo	Columbus	Milwaukee
Providence	Syracuse	Birmingham
Lebanon	Toledo	Cincinnati
Baltimore	Youngstown	Bethlehem
Rochester		Portland, Me.

THE BARRETT COMPANY, Ltd.
Montreal Toronto Winnipeg Vancouver

The New Gardner-Denver WD-2 Wagon Drill

A New Wagon Drill

A NEW wagon drill with a heavy square off-set axle, which carries the wheels well forward to eliminate the danger of up-setting the outfit when pulling a tight steel with the air hoist, has been announced by the Gardner-Denver Co., Quincy, Ill. The air hoist throttle and the drilling and blowing controls are within easy reach of the operator.

With this new WD-2 wagon drill, holes may be spotted and collared easily in rough ground because of the quick-acting convenient centralizer. The outfit can be equipped with a hand winch with cable and steel puller for raising and lowering long steels. The one-piece cast slide is arranged to take any Gardner-Denver drill. Clamps and bolts hold the drill to the slide securely and are completely accessible from the rear by raising the drill so that it clears the ladder. There are no annoyingly close wrench clearances.

Grading Maintenance Made More Accurate

A NEW tell-tale signal which shows whenever the blade of a maintenance grader departs from the proper cutting position, has been developed by the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill. This new Austin Grade-Ometer makes possible the setting of the blade to cut and maintain constantly a flat or sloping surface as easily as a motorist governs the speed of his car. It is particularly adaptable for use on shoulder, subgrade, oil-mix and retread work and for securing accurate grades when maintaining dirt or gravel roads.

The principle on which the Austin Grade-Ometer operates is simple. In the cab there is a calibrated gage or indicator, equipped with a U-shaped glass tube which is partly filled with a red, temperature-resisting fluid and only one-half of the tube is exposed to view. On the blade-supporting circle, a similar U-shaped arrangement is installed. Two small reservoirs filled with a temperature-resisting fluid are connected to each other at the bottom by a small air-tight pipe. Both the indicator in the cab and the reservoirs mounted in the circle are connected to each other by two air-filled pipes. When the circle and the blade are in level position, the indicator registers zero. When the heel or toe of the blade is raised or lowered, the liquid flows from the bottom of one reservoir into the other, raising the column of air in one pipe line and lowering the column of air in the other. This unbalanced air condition is transmitted to the indicator, causing the liquid within the glass tube to rise or fall. The Grade-Ometer gage is calibrated on one side in degrees and on the other in inches per foot.

Portable Power Set for Pumping Saves Money

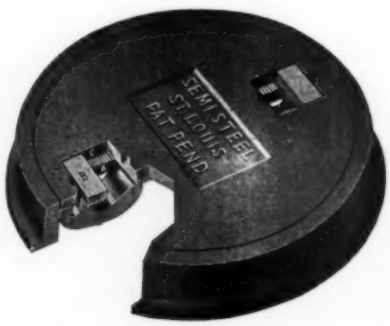
REPLACING steam power, a portable 30-kw electric generating set is reported to be saving $20.00 a day in pumping clay pits. As the pits of the Illinois Brick Co., Chicago, Ill., had been shut down temporarily it would have been necessary to start up its boilers to furnish the steam for pumping the pits dry. This would have entailed a cost of from $50 to $60 per day, including the initial warm-up period, labor and fuel. With a portable Westinghouse 30-kw generator unit made by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., it costs only about $30 a day, requiring the minimum amount of attention.

The generator is driven by a Hercules gasoline engine requiring about 100 gallons of gas and oil a day. Being portable, it has been placed on a truck and transported from one plant to another as needed. Arriving at the plant the truck is stationed nearest the point of control and in 15 or 20 minutes the pumps are running. Under the steam power method it was necessary to warm up a boiler for two or three days before the pumps began working completely. About 125 feet of cable is used from the generator to the 25 to 50-hp motor-operated pumps. This is a unit which can be used for many purposes in the varied fields of contracting.

A Noiseless Manhole Cover

NINETY per cent of manhole cover breakage is said to be due to loose covers and the pounding such covers receive from constant traffic. Twenty-five per cent of all loose covers have to be replaced in 10 years, due to wear alone. In addition, noisy manhole covers are a serious nuisance in residential and business sections of a city, as well as being dangerous.

The Rigid-Lock manhole cover, which is manufactured by the Semi-Steel Casting Co., 109 E. Quincy St., St. Louis, Mo., is designed to overcome such conditions. It locks securely to the frame of the manhole and cannot rattle or come loose. It is made of semi-steel, with extra strength, and is weather-resisting. The locking parts are of malleable iron and can be adjusted to any condition found in individual frames. Both covers and frames for either round or square cover types or covers only to fit frames already installed can be furnished.



The Rigid-Lock Manhole Cover

Williamsport *wire rope is more* DEPENDABLE·

There's nothing more exasperating to a user than to have ropes which move a variable number of yards of material. To have an equipment go out of service until a new rope is installed is expensive and unpleasant.

Williamsport's system of manufacture and testing, we believe, is exceptionally uniform in productive results. This is learned through an exhaustive check by our engineering department.

Operators tell us that they can figure out mighty accurately what a Williamsport wire rope will do on a job. And doesn't that help you when you *figure* a job? We think so. Try a Williamsport on your next replacement and get a pleasant surprise.

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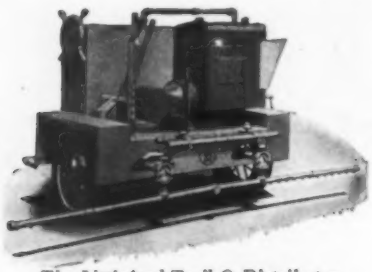


The Littleford Trail-O-Distributor

A Tank Truck Auxiliary Distributor

WHERE long hauls are involved on penetration jobs or on road oiling, it is expensive to tie up complete distributor units merely for hauling the bituminous material. The Trail-O-Distributor made by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio, remains on the job and is attached to each tank truck as it arrives on the job. The Trail-O-Distributor is nothing more or less than the working end of a Littleford pressure distributor mounted complete on a separate trailer unit. The high speed trailer is equipped with pneumatic tires, Timken roller bearings and semi-elliptical springs. A novel feature of the trailer is its adjustable tongue which can be made to fit trucks of any height. This feature is very desirable as, quite frequently, trucks of different makes are used with the supply tanks to which the distributor unit is connected. After the spray bar on the Trail-O-Distributor is adjusted to the desired position, it is unnecessary to make further adjustment when supply tanks are changed. The adjustable tongue takes care of the difference in truck heights and the spray bar remains in the correct position.

The Trail-O-Distributor can be provided with either a 200 or 300-gallon pump. It has the Littleford single-valve control which makes possible the shortest pipe connection to the spray bar and it is possible to suck the material from the spray bar back to the tank, thereby eliminating dripping after the spraying is cut. This valve mechanism is so arranged that one or two connecting hose to a tank can be used. If the supply tank has a heating unit, it is possible with two hose to circulate material in the tank while the temperature is being raised. If it is not necessary to circulate the material, only one hose need be hooked up to the supply tank. Another feature is that all pipe fittings, pump and valve mechanism are enclosed in a chamber enabling the operator to warm these parts when operating in cool weather. It is also so arranged that a burner can be placed in this hood.

Four New Six-Wheel Trucks

FOUR new six-wheel trucks, Model 16 with single drive and Model 17 with tandem drive, both of 3-ton capacity, and Models 36 and 37, of 4½-ton capacity with single and tandem drive respectively, have recently been announced by the Federal Motor Truck Co., Detroit, Mich.

The new Federal styling and sturdiness of construction are combined in these new models, other features of which are a large slanting V-type chrome-plated radiator, long streamline hood and cowl with door-type ventilators, wide sweeping fenders, wide chrome-plated channel-type front bumper and full chrome-plated head lights with Twin Disc horns mounted underneath. These new models incorporate a patented basic six-wheel design which has been improved through years of experiment and usage.

Models 16 and 17 are powered with a 6-cylinder 7-bearing truck engine with a 3⅝-inch bore x 4¼-inch stroke. The clutch is of the single dry-plate type, 11 inches in diameter equipped with a vibration dampener. A 4-speed transmission is mounted in unit with the engine. Hydraulic brakes 15 inches in diameter by 2¼ inches wide with cast drums operate on all six wheels. Standard tires are 6.00/20 truck-type balloon front and 32 x 6 8-ply single high pressure on the four rear wheels mounted on cast steel spoke wheels.

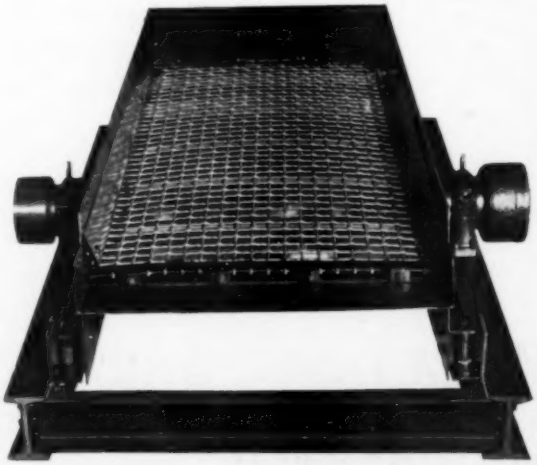
Models 36 and 37 are equipped with a unit power plant comprising a 6-cylinder 7-bearing engine of 4⅛-inch bore x 4¾-inch stroke, a 13-inch single dry-plate clutch and a 5-speed transmission with a silent fourth. The braking system is hydraulic, operating on all six wheels and amplified by a vacuum booster. Ventilated disc-type wheels carry 7.50 x 20 8-ply balloon tires, single front and dual rears. The wheelbase lengths supplied are 192, 205 and 218 inches.

Gyrating Screens Increase Production

A MECHANICALLY-VIBRATED screen, using a counterbalanced eccentric shaft to give positive, smooth action, is manufactured by the Simplicity Engineering Co., Durand, Mich. A simple balance compensator mounted on the end of the shaft allows the field operator to adjust easily for any changes in screen cloth weight so as to maintain balance. Resilient rubber mountings support the screen corners so that all the positive gyrating action is imparted to the screen decks and is not dissipated in the supporting frame work.

The screen cloth is stretched taut all four ways over bars which are crowned both sideways and end ways, eliminating cloth sag and wire whip. Lighter wire can then be used with corresponding increase in open space, thus increasing the capacity, and eliminating blinding. Each lower deck of double or triple deck screen is set 2½ degrees steeper to aid small oversize particles in moving down against the screening action. This permits a flatter setting for the top deck, thereby increasing its efficiency.

The complete gyrating assembly is carried by heavy-duty ball or roller bearings in dustproof and waterproof housings protected by labyrinth bronze seals. The Simplicity gyrating screens are furnished with either flat pulley drive, V-belt drive, or direct motor drive. The screens are particularly adaptable in grading and washing sand and gravel and crushed stone and are used extensively in portable plants. They are built in the following sizes: 2 x 3 feet, single and double deck; 2 x 6 feet, 3 x 6 feet, 4 x 8 feet, 3 x 12 feet, and 4 x 16 feet in single, double and triple deck.



A Single-Deck Simplicity Gyrating Screen, Showing the Screen Arranged for a Flat Belt Drive